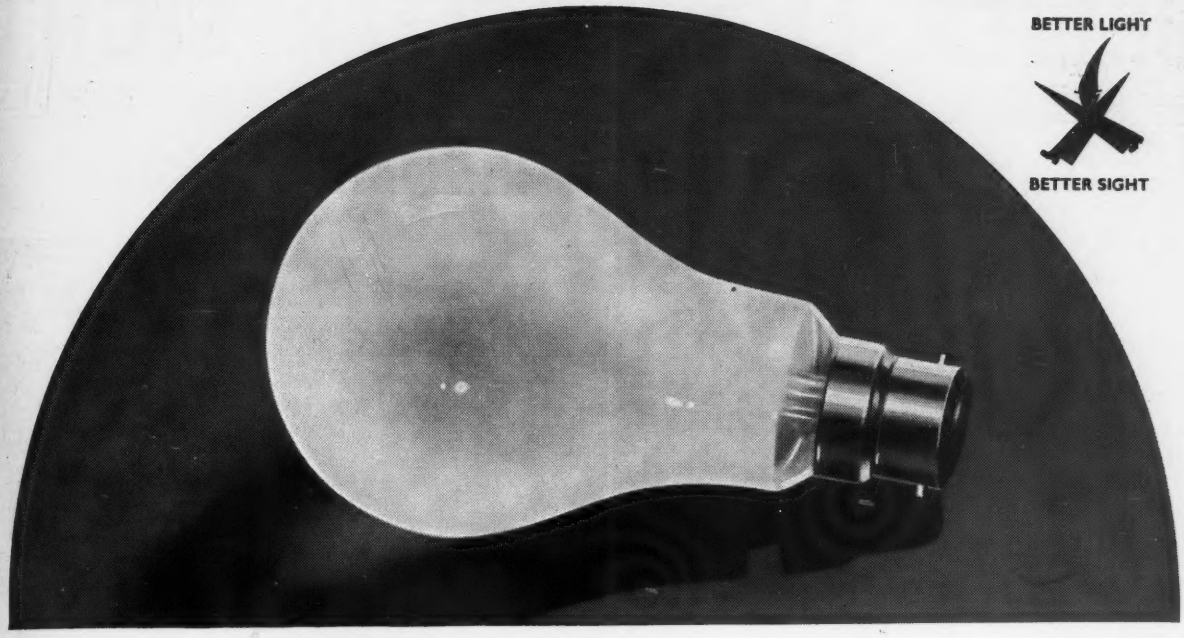


Osram

the wonderful lamp

Specify the lamps that are backed by a wonderful reputation—the famous Osram Coiled Coil—and your installation will be right

A G.E.C. PRODUCT

Advt. of The General Electric Co., Ltd., Head Office: Magnet House, Kingsway, London, W.C.2

BETTER LIGHT BETTER SIGHT

DAY AND NIGHT ILLUMINATION

The light in the shade of a porch upon an average day is equal to 500 foot-candles. The light offered in the average lighted room after darkness has fallen is 5 foot-candles. Can it be wondered at that the majority of people suffer from eye-strain and defective sight?

Yet good lighting is one of the cheapest things in the world, and is one of the easiest to ensure.

The E.L.M.A. Lighting Service Bureau is maintained by the manufacturers of the following brands of British Made lamps

OSRAM MAZDA EDISWAN
SIEMENS COSMOS CRYSELCO

The WESTON "Lightometer" incorporates the famous "Photronic" photo-electric cell, an exclusive WESTON feature. Small, portable and of rugged construction, it does not suffer deterioration or change in calibration, even though exposed to direct sunlight. As a double-range instrument it gives readings of 0.50 and 0.500 foot-candles.

As easy as reading the time

You can let Customers test their own Lighting with the

WESTON "LIGHTOMETER"

"More Light—Better Sight." This slogan is making consumers conscious of the need for more light and all that it implies in terms of lamps and fittings.

But how much more light do we need? That is the question your customers will ask. Put yourself in a position to tell them quickly and accurately by using the pocket-sized WESTON "Lightometer."

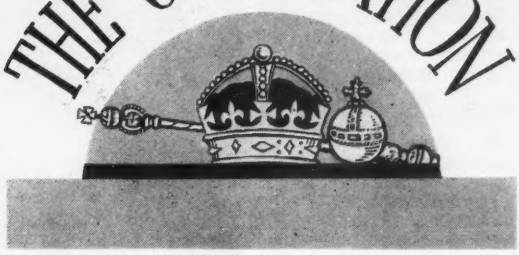
Measuring lighting with the WESTON "Lightometer" is "as easy as telling the time." In fact, your customers can take their own readings just as accurately as you can.

Take this handy little instrument round in your pocket. You can use it dozens of times a day to get additional orders for lighting equipment.

WESTON
"Standard the World over"
PIONEERS SINCE 1888

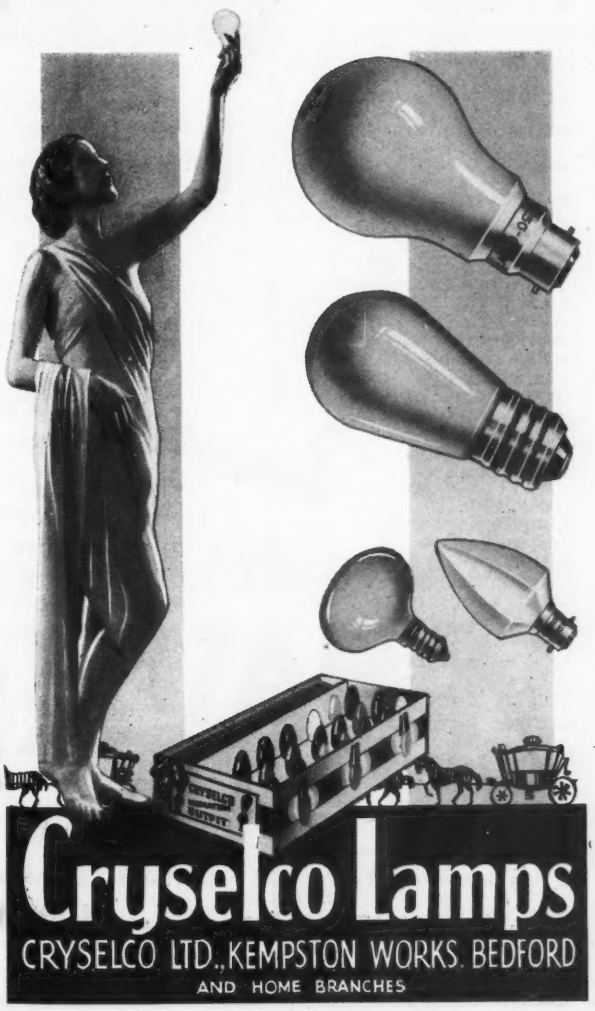
Advertisement of the Weston Electrical Instrument Co., Ltd., Kingston By-pass, Surbiton, Surrey. Elmbridge 6400

ILLUMINATIONS FOR THE CORONATION



Cryselco Lamps cover every need for Coronation Illuminations from the 15 watt Inside Colour Sprayed Sign Lamp to 3000 watt Gasfilled Projector Lamps for Floodlighting. For home illuminations there are the popular Decoration Outfits of olive shaped coloured lamps with holders wired complete for use.

Send for illustrated catalogue which gives the complete range.



Cryselco Lamps

CRYSELCO LTD., KEMPSTON WORKS, BEDFORD
AND HOME BRANCHES

GOOD LIGHTING

must prosper !

TOWN COUNCILS, BANKS, GOVERNMENT BUILDINGS, ETC.

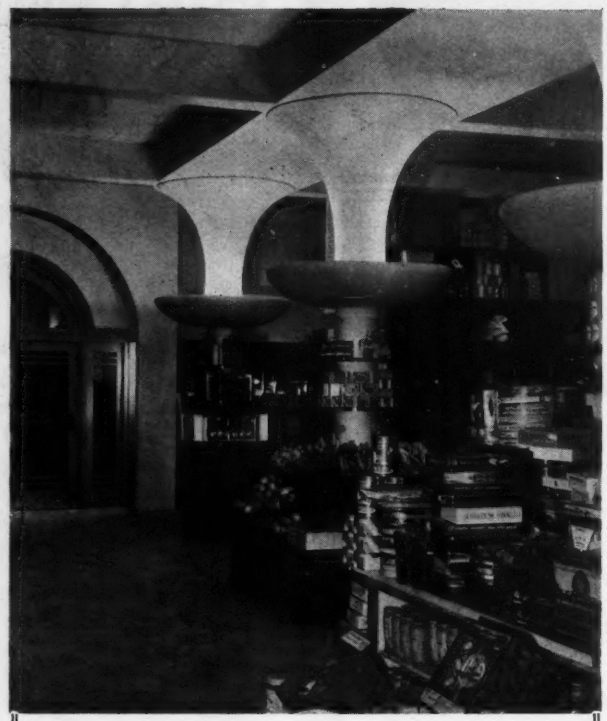
BRITISH MUSEUM
NEW GEOLOGICAL MUSEUM
DISTRICT BANK, MANCHESTER
BRITISH INDUSTRIES HOUSE
TOWN HALL, SCARBOROUGH
WORTHING CORPORATION
DUNDEE CORPORATION
WALTHAMSTOW B.C.
COMMONWEALTH OF AUSTRALIA
CANADA HOUSE
DUNKINFIELD CORPORATION
W. SUSSEX COUNTY COUNCIL
BOLTON CORPORATION
ROYAL EMPIRE SOCIETY
BATTERSEA BOROUGH COUNCIL
FITZWILLIAM MUSEUM, CAMBRIDGE
MALDEN & COOMBES U.D.C.
GLASGOW CORPORATION TRANSPORT DEPT.
LEYBOURNE GRANGE MENTAL COLONY
KENT COUNTY COUNCIL
DUMBARTON COUNTY COUNCIL
LONDON PASSENGER TRANSPORT BOARD

SHIPPING.

R.M.S. "QUEEN MARY"
S.S. "FRANCONIA"
S.S. "CARINTHIA"
S.S. "GRACIE FIELDS"
(Southampton, Isle of Wight Royal Steam Packet Co., Ltd.)

OFFICES, SHOWROOMS & STORES.

LIVERPOOL CO-OPERATIVE SOC., LTD.
NEWCASTLE CO-OPERATIVE SOC., LTD.
ROYAL ARSENAL CO-OPERATIVE SOC., LTD.
SHEFFIELD & ECCLESHALL CO-OP. SOC., LTD.
GREENOCK CO-OPERATIVE SOCIETY, LTD.
BRIGHTON & SUSSEX BUILDING SOCIETY. LTD.
L.M.S. RAILWAY—HEAD OFFICE
UNITED STATES LINE
LEGAL AND GENERAL ASSURANCE SOCIETY, LTD.
C. & M. SUMRIE, LTD., LEEDS
SHANKS & CO.
ODHAMS PRESS, LTD.
BRITISH CELANESE, LTD.
HALL & HALL, LTD.
TREASURE COT, LTD.
ANGLO-IRANIAN OIL CO., LTD.
GALLERIES LAFAYETTE, LTD.
RUSSELL & BROMLEY, LTD.
JOHN HARPER, LTD., WILLENHALL
KODAK, LTD.
D. NAPIER & SON, LTD.
CAR MART, LTD.
MARKS & SPENCER, LTD.
AQUASCUTUM, LTD.
LIBERTY & CO., LTD.
HEAL & SONS, LTD.
RAY & MILES LTD., LIVERPOOL
WM. CRAWFORD & SONS, LTD., LIVERPOOL
DIXON & PARKER CO., LTD., NOTTINGHAM
GRIFFIN & SPALDING, LTD. NOTTINGHAM
DUDENEY & JOHNSTON, BEDFORD
LEICESTER EVENING MAIL
BRADLEYS, LTD.
GAS LIGHT & COKE CO., LTD.
GIVANS IRISH LINEN STORES, LTD.
BRITISH INSULATED CABLES, LTD.
CRANE, LTD.
DAGENHAM MOTORS, LTD.



Lighting is becoming a more and more important factor in everyday life. Many who were disposed to regard it as merely a matter of lamps and current now recognise that scientific principles are involved.

In the few years since G.V.D. initiated the new order of lighting, an imposing list of contracts has been executed. Those listed here are but a selection.

Plans are set for a further big expansion during 1937, and it is safe to predict a prosperous New Year for the G.V.D. organisation which is working on sound and progressive lines to meet a widespread need.

G·V·D

ILLUMINATORS, LTD.
ALDWYCH HOUSE, ALDWYCH,
LONDON, W.C.2
Holborn 7277-7278

OFFICES, SHOWROOMS & STORES —Continued.

GRECH & HICKS SHOE CO., LTD., MALTA
BOVIS, LTD.
GALE & POLDEN, LTD.
WOOLWICH EQUITABLE BUILDING SOC.
QUEEN ANNE'S BOUNTY
J. & P. COATS, LTD.
BENNIE LIFTS, LTD.
COLVILLES, LTD.

ELECTRICITY CORPORATIONS & SHOWROOMS.

SUSSEX ELECTRIC SUPPLY CO., LTD.
METROPOLITAN ELECTRIC SUPPLY CO., LTD.
BOMBAY ELECTRIC SUPPLY CO., LTD.
GLASGOW CITY COUNCIL, ELECTRICITY SHOWROOMS
ISLE OF WIGHT ELECTRIC POWER CO., LTD.
EDMUNDSONS ELECTRICITY CORPORATION, LT D

HOTELS & RESTAURANTS.

EUSTON HOTEL
CONNAUGHT ROOMS
WHITBREAD & CO., LTD.
BENSKINS WATFORD BREWERY CO., LTD.
LEVY & FRANKS, LTD.
GRAND HOTEL, DOVER
OCEAN HOTEL, SANDOWN
LANGHAM HOTEL
MAISON LYONS, COVENTRY STREET
TROCADERO RESTAURANT
REGENT PALACE HOTEL
SAN MARCO RESTAURANT
ROYAL COURT HOTEL, SLOANE SQUARE
MOUNT ROYAL, MARBLE ARCH
SLATER & BODEGA, LTD.
ROBB BROS., BIRKENHEAD
McVITIES, GUEST & CO., LTD. EDINBURGH
M. ROBINSON & SON, LTD., STOCKTON-ON-TEES
BLACK BOY HOTEL, NOTTINGHAM
QUEEN'S RESTAURANT, SLOANE SQUARE
DURBAN HOTELS, LTD., S. AFRICA
ODDENINOS RESTAURANT
WINNING POST HOTEL, WHITTON
COUNTY HOTEL, BLACKPOOL

SCHOOLS & COLLEGES.

BIRKBECK COLLEGE
BATTERSEA POLYTECHNIC
CHELSEA POLYTECHNIC
LONDON UNIVERSITY
UNIVERSITY COLLEGE, DUNDEE
DARTINGTON HALL TRUSTEES
SCHOOL OF DOMESTIC SCIENCE, DUNDEE

CINEMAS, THEATRES, CONCERT HALLS.

PAVILION, BOURNEMOUTH
REGAL CINEMA, HIGHAMS PARK
CURZON CINEMA, MAYFAIR
CURZON CINEMA, BRIGHTON
BENACHIE CONCERT HALL, DUNFERMLINE
TRANSPORT & GENERAL WORKERS' UNION

HOSPITALS.

WILSON HOSPITAL, MITCHAM
ST. JOHN'S HOSPITAL, LONDON, W.1
DUDLEY ROAD HOSPITAL, BIRMINGHAM

REGULATIONS *and* OBLIGATIONS

– in respect of Artificial Lighting

THE REGULATIONS

The plaintiff relied, in support of his allegation of breach of statutory duty against the defendants, upon the Factory and Workshop, Dangerous and Unhealthy Industries, Regulations (Statutory Rules and Orders 1934, No. 279) Regulation 12, which requires that where any process of "loading, unloading, moving or handling goods" is being carried on, the places where the work is being carried on shall be "efficiently lighted."

THE OBLIGATION

The circumstances in which the plaintiff sustained his injuries were as follows: A ship, after unloading, was lying in dock and he was working in it, on the shelter deck, and after the gang had replaced all the hatch covers, one had been left off for the purposes of ventilation; the shelter deck was illuminated by electric lamps in portable groups, but in the vicinity of the hatch which was left open the area was very dark; the fencing of the hatchway was loose and the plaintiff fell into the hold.

The learned Judge concluded that at the time that the plaintiff met with his accident the process of unloading was in process of completion, and that so long as it remained uncompleted, the shipowners were continuously obliged to comply with the requirement with regard to efficient lighting. That obligation they had failed to discharge.

WHAT IS A FACTORY?

Section 104 of the 1901 Factory and Workshop Act provides that the restrictions referred to as applicable to "dangerous machines" are to be applied as if "every dock, wharf, quay and warehouse and all machinery or plant used in the process of loading or unloading or coaling any ship in any dock, harbour or canal were included in the word 'factory,' and the purpose for which the machinery or plant is used were a manufacturing process."

THE PENALTY

The above extracts are from an informative article by W. Summerfield, M.A., in a recent issue of "The Electrical Review." The principles dealt with are widely applicable to factories and workshops in general, and the award of £800 with costs, in the case, represents only one of the responsibilities the factory and works' owner with inadequate lighting is liable to incur. Reduced production and increased spoilage through bad lighting can take an even bigger toll of factory profits.

Review your existing lighting arrangements NOW and avoid future expense.

To meet all Regulations & Obligations

Specify and instal **BENJAMIN**

PLANNED **LIGHTING**

THE BENJAMIN ELECTRIC LTD., BRANTWOOD WORKS, TOTTENHAM, LONDON, N.17

B2

Better Light Better Sight

SIEMENS

"COILED-COIL"
ELECTRIC LAMPS
BRITISH MADE

Give LIGHTING SATISFACTION WHEREVER USED

UP TO 20% MORE LIGHT than from Ordinary Lamps

Advt of SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED. 38/39, Upper Thames Street, London, E. C. 4.
Branches at-Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield, Southampton

Incorporating "The Illuminating Engineer."

Light and Lighting

Official Journal of the Illuminating Engineering Society.

32, Victoria St., London, S.W.1.

Edited by J. STEWART DOW

Telephone: Victoria 5215

Vol. XXX.—No. 1 **January, 1937** PRICE NINEPENCE Subscription 10/6 per annum, post free

Principal Contents:

	PAGE
Editorial Notes	1
Notes and News	2
Light in Daily Life	3
Low Voltage Neon	5
Colorimetry	7
Lighting the Empire Exhibition, Johannesburg	8
Lighting Developments in Australia	11
Gatwick Airport	12
I.E.S. Exhibits	13
Lighting and Literature	18
Recent Patents	20
Reviews of Books	21
Electric Illumination Exhibition	22
The Editor Replies	24
Where to Buy	27

Promotion of Knowledge and its Dissemination

TO promote the general advancement of illuminating engineering and the utilisation of natural and artificial light and the dissemination of knowledge relating thereto . . .

This is the first of the objects of the Illuminating Engineering Society, as set out on the first page of its Memorandum of Association.

It has done a good deal to foster knowledge. It has not yet done nearly enough to encourage its dissemination. How much it is able to do depends primarily on the aid and zeal of its members.

The President of the American Illuminating Engineering Society (Mr. L. A. S. Wood) recently recalled the saying that the Society "stands on a tripod, being based on the three legs of the scientific, the commercial, and the philanthropic."

This applies also to the British Society. It cannot, of course, associate itself with efforts to sell lamps or gas or electricity. But it can, and should, encourage and identify itself with any educational effort to create interest in lighting and its benefits, even if originated by bodies concerned with one aspect (e.g., gas lighting or electric lighting) only. The essential criterion is that the effort should be of a genuine educational nature.

Naturally, in such cases, the Society can only act on invitation. But—and commercial bodies should realise this—it is in their own interests to enlist the help of the I.E.S. and to make it as big a thing as they can—to exalt in every way possible a voice which is not associated with commercial ends, and which, when stating the claims on good illumination, speaks for everyone.

I.E.S. Activities.

The appended list of forthcoming events is an indication of the growing activities of the Illuminating Engineering Society. We would like to draw the attention of members specially to two forthcoming events, the "Informal Social Evening" on February 12, and the opening meeting of the Industrial Lighting Section, which is to be held at Watson House on February 9.

The "Informal Social Evening" is quite a new departure, which may be regarded as an alternative to the annual dinner (to be held on March 16 this year), specially devised for the benefit of the younger members and friends. Ladies may be invited, and we understand that several entertaining events, including an illustrated burlesque lecture and a mock trial ("Lumens at Law"), are being arranged.

Those who attend the subsequent meeting on February 9 will have an opportunity of seeing something of the new Watson House, which they will find full of interest.

Notices of these events are to be circulated; members are particularly requested to note that in these two cases the hon. secretary will need to have intimations from those who propose to attend.

Further Special Sections.

The first of the proposed "Sections" of the Society to handle special topics is that dealing with photometry, which was started last year and is running quite smoothly and successfully. On page 7 will be found an account of the recent meeting at which Mr. Guild gave an address on colorimetry. It is perhaps not too early to recall that another meeting—to take place at the G.E.C. Research Laboratories, Wembley—has been fixed for February 22, when Mr. G. T. Winch is to give a paper on precision photometry. This, too, is likely to be a popular meeting. For the benefit of recent members, we may recall that all members of the Society interested in the subjects treated are free to join such sections (which involve no additional subscription); but, in order that they may receive notices of forthcoming events, they should inform the hon. secretary of the section (in this case, Mr. K. F. Sawyer, Watson House, Townmead-road, London, S.W.6.), if they have not yet done so.

It is now proposed to form two additional sections dealing respectively with industrial lighting and public service lighting (the latter including various supplementary applications of light besides street lighting). The first meeting of the former is, as stated above, to take place on February 9, when, following Mr. Weston's paper, an opportunity of discussing the future of the section will be afforded.

A similar opportunity in connection with the Public Service Lighting Section will arise at a meeting in March, when several papers on street lighting are to be read. We understand that special honorary secretaries will be appointed for these two sections, and members who wish to join should send in their names.

Forthcoming Events

Jan. 12th. Mr. J. W. Howell on **Some Important Considerations in Colliery Lighting.** *(General Meeting of the Illuminating Engineering Society, in the Lecture Theatre of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1);* **6.30 p.m.**

Jan. 12th. Mr. R. O. Ackerley on **Some Aspects of Architectural Lighting.** *(Local Sectional Meeting of the Illuminating Engineering Society, Dublin).*

Jan. 14th. Local Sectional Meeting of the Illuminating Engineering Society *(at the Cadora Restaurant, Union Street, Glasgow);* **7.30 p.m.**

Feb. 9th. Mr. H. C. Weston on **Lighting and Industrial Performance.** *(Meeting of the Industrial Lighting Section of the Illuminating Engineering Society at Watson House, Townmead Road, Fulham, S.W.6);* **6.30 p.m.**

Feb. 12th. Informal Social Evening of the Illuminating Engineering Society *(at St. Ermins Hotel, St. James's Park, S.W.1.);* **6.30 p.m. Tickets 2/6 each.**

Feb. 17th. Mr. G. H. Wilson on **Road Lighting and Road Surfaces.** *(Meeting of the Institute of Civil Engineers (Manchester District) at 36, George Street, Manchester);* **6.0 p.m.**

Feb. 18th. Mr. P. Freedman on **Low Voltage Neon.*** *(Local Sectional Meeting of the Illuminating Engineering Society at Cadora Restaurant, Union Street, Glasgow);* **7.30 p.m.**

Feb. 22nd. Mr. G. T. Winch on **Some Practical Aspects of Precision Photometry.** *(Meeting of the Photometric Section of the Illuminating Engineering Society at the Research Laboratories of the General Electric Company, Ltd., Wembley).*

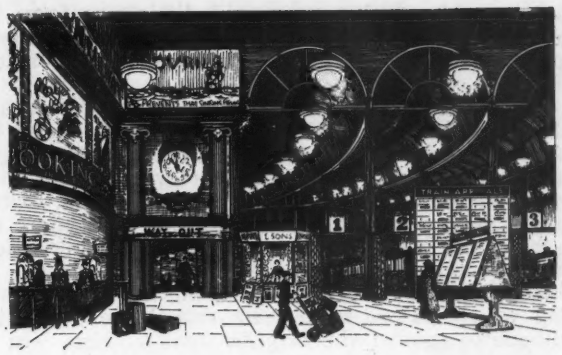
Feb. 23rd. Mr. Howard Long on **Diffusion and Shadows.** *(General Meeting of the Illuminating Engineering Society at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2);* **6.30 p.m.**

**Repetition of paper read in London on December 8.*

Light in Daily Life

(IV) Light and Transport

The Old Stage Coach—Light on the Railways—Illuminated Timetables, Destination Boards and Station Name Plates—The Comfort of Travellers—Luminous Traffic Signals—Motor Car Headlights—Fog Penetration and Glare—Light and Sea-going Traffic—Light and Aerial Navigation.



If "the Lighting of the King's Highway," discussed in the last article of this series, is vital to the speed and safety of road traffic, it plays an equally important part in other modes of travel.

Let us, however, first consider the oldest form of transport—by road. Impressions of the old stage-coaches are apt to be founded on the merry excursions of Pickwick. We should probably not be captivated if we could experience them now. To be held up by highwaymen was scarcely a pleasant experience, though no doubt, in later times, an infrequent one. The main impression, one gathers, of such a journey, was one of great cold and interminable boredom. Reading by night must have been impracticable, and no conversational art could outlast so many hours. Those of us who recall trips in the straw-lined buses of our childhood, provided with a single smoky oil-lamp at one end, can imagine something of the discomfort of a stage-coach.

Light on the Railways.

In the railway carriages conditions were at first little better. Long after roofs had been furnished, the light was feeble to a degree. Many of us can remember when wax candles, to be mounted on brackets attached (by means of rubber suckers) to the window pane, were regularly sold to first-class passengers. Mr. Arthur Cunnington, the lighting engineer to the Southern Railway, has had the curiosity to measure the actual illumination at reading level in certain old coaches, equipped with the original colza lamps, and to compare it with that furnished later by flat-flame gas burners, incandescent burners, and electric filament lamps. One gathers that the original gas burners furnished an illumination of about a quarter of a foot-candle, perhaps a fiftieth of the light frequently found in the latest coaches on tube railways of to-day—and the oil lamps perhaps one hundredth of that now provided! In motor coaches and buses progress has been equally substantial. A very great advance was scored with the advent of electric metallic filaments, which can be so readily manufactured for the low-voltage generators used on motor-coaches of to-day.

On railway station platforms the lighting has likewise improved. One gets some conception of the Stygian gloom of railways of the 'eighties if one reads the exuberant praise in the papers of the period of the "fairylike" brightness on the City and South London tube—the first of the series. Yet it is possible to compute that the illumination at the Oval in 1890 was only one-twentieth or one-thirtieth what it is to-day. The Underground Railways have been quick to realise the value of good lighting, but on surface railways also, though the amount of light is not yet all that one could desire, it is in most cases vastly greater than in the days of which we have just been speaking.

Giving Information by Light.

In many other ways railways are making use of light to advantage. It is now quite a number of years since the idea of using racks containing time-tables, illuminated from within, was first tried—introduced at Waterloo Station. Rather singularly (for the method has evident advantages, notably in eliminating troublesome shadows cast by the heads of observers) this method of illuminating time-tables has not become usual, but nevertheless some effort is almost invariably made nowadays to illuminate them in some degree. Well-lighted destination boards, showing the complete course of each train and its departure platform, are now to be found at many railway terminals. Numbers of platforms and destinations of trains are marked in luminous letters. Everywhere the illuminated sign is being used as a means of giving information. The amount of questioning thus saved the staff is beyond computation. On the Underground Railways, where this method is being used to an ever-increasing extent, it would probably be quite impossible to deal with the vast crowds that assemble at rush hours at important junctions of traffic in any other way.

Other applications of light on railways include modern methods of illuminating station name-plates. It is singular to reflect that until quite recently no special effort to light up name-plates was made. Indeed, there are still many stretches of railway where a passenger unfamiliar with the line is put to much unnecessary trouble at night in recognising where he has arrived. Railway stations are, even to-day, in general far behind places of entertainment in one respect. Many of them make little effort to advertise their presence by signs or floodlighting so that they can be recognised from afar. It should be realised that when someone wishes to know the whereabouts of the station, he is also, quite commonly, in a hurry!

One final development on railways may be noticed—the gradual replacement of the old and cumbrous semaphore signs and the substitution of signals lighted by electric light and bright enough to operate in full daylight.

Luminous Traffic Signals.

We have already discussed ("The Lighting of the King's Highway") the use of light on what is still—perhaps more than ever to-day—the main means of travel, the open road. At the present moment there is taking place a revolution not merely in the lighting of highways, but in their general equipment for traffic. The luminous traffic signals, now so familiar, were regarded askance but a few years ago. It was freely predicted that such methods, however applicable to the rectangular planning of roads in Continental and American cities, were unsuited to the narrow winding ways of Great Britain. Actually they have been readily adapted to our needs. If one regrets the fact that the open road is coming more and more to resemble the railway, and that the motor tourist is rapidly becoming an engine-driver, shaping his course not according to his desires but in deference to the demands of signals—one must admit that the use of light in this way undoubtedly saves many lives, as well as expediting the ever-growing flow of traffic. In other respects light continues to play an increasing part on the roadway. In olden days, used but sparsely, it served to guide the wayfarer to the infrequent inn. To-day, not only hotels,

but "road-houses" (a new and distinctive form of place of entertainment), garages, and filling-stations are all floodlighted. Roads are becoming ribbons of light.

It is probably only a question of time before all the main thoroughfares of this island are lighted to such a standard that headlights will become superfluous. But in the lesser roads motor-headlights will continue necessary for some time to come. One point, may, however, be emphasised. The effect of a motor-car headlight in causing objects on the roadway to appear brighter than their background is exactly the opposite of most forms of street lighting which, as we have seen, reveal the object in silhouette against the brighter road-surface. On a moderately well-lighted road, therefore, the use of headlights tends to counteract the effect of modern street lighting, but on dark country roads, where little lighting is provided, motor-car headlights will continue to be needed.

Motor-car Headlights.

Endless ingenuity has been expended on the problem of designing forms of headlight which shall illuminate the roadway efficiently but give rise to a minimum of glare. One of the best known designs for this purpose is that which gives a flat-topped beam, so that all but a minimum of diffused light is cut off above a specified horizontal plane. The roadway would thus be strongly illuminated but not the faces of approaching people. Whilst good in principle, the idea is subject to limitations. The theoretical distribution of light is easily disturbed. A slight derangement in the position of the light-source in the headlight, unequal loading (giving a tilt to the whole vehicle), and undulations on the roadway—all these shift the line of demarcation of the beam and may bring the face of the approaching driver or pedestrian into the limelight. On the whole, the practices now becoming general of dipping headlights when approaching another car, or of using headlights furnished with two alternative beams, one of which whilst less powerful, is relatively free from glare, seems to have proved as useful as any.

Much attention has been also devoted to the colour of the light (a) with a view to diminishing glare, and (b) from the standpoint of fog-penetration. Whilst claims for various types of tinted glasses have been advanced, preferential value is most frequently assigned to yellow light. Scientific opinion in this country, however, does not support the view that colour conveys any very great advantage in regard to the penetration of mist or fog, whilst glare is regarded as primarily a function of candlepower or brightness.

A recently suggested method of diminishing glare from headlights is by using the newly introduced polarised screens. A windscreen of such material, for example, might be designed to check most of the direct light from approaching headlights whilst admitting reflected light from the roadway, which is mainly polarised.

Fog Penetration.

The problem of fog-penetration is admittedly unsolved. Theoretically there is a possible approach based on the use of infra-red radiation, the passage of which is little affected by the condition of the atmosphere. Occasionally reports of inventions based on this idea are noted. The difficulty, however, is twofold, firstly to produce a beam of sufficient power, and secondly to devise a means by which the image of the object on which the radiation is received can be quickly and clearly revealed. Sir William Abney many years ago demonstrated that it was possible to take a photograph by the heat of a steaming kettle. But there is no ready means by which its presence and form, when at a distance, can be instantly detected.

Light and Sea-going Traffic.

The part played by light in connection with transport at sea and in the air as well as on land should not be overlooked. On the ships themselves the revolution effected by electric lighting in the confined spaces under deck has been of immense benefit. Ship-lighting presents innumerable special problems, not the least of which is the lighting of the hold and of the cargo whilst in process of being taken on or unloaded. Equally numerous are the opportunities for supplementary illuminants, especially in the event of mishaps by night. In times of peril the regular lighting of the vessel may be completely out of action; a good stock of the efficient self-contained portable lamps available to-day (acetylene, incandescent, paraffin, etc.), might sometimes prove of great value. The display of lights has long been the traditional signal of distress at sea. A powerful beam of light may be invaluable for picking up distant boats or shipwrecked survivors floating in the sea. The famous *Titanic* disaster called attention to the possible value of searchlights in detecting icebergs. On warships searchlights serve as the eyes of the vessel and much research has been expended on the aim of securing more powerful and concentrated beams.

Lighthouses and beacons have been used as a safeguard from time immemorial. The application of light in this way was studied scientifically long before its use for domestic and commercial ends. Electric incandescent lamps of special design and great power have recently proved of value, and it is possible that some of the very latest types of gaseous discharge lamps, operating at the highest efficiency known, and credited with a brightness of 500,000 candles per square inch, may prove more valuable still. Of late years the admitted inability of light to achieve its purpose in dense fog and mist has been compensated by the use of wireless warnings and direction-finding apparatus. Some have gone so far as to predict that these methods may replace luminous signals entirely. But this seems unlikely, at least for many years to come.

Light and Aerial Navigation.

Light as an aid to aerial navigation has been the subject of many international congresses, notably that held in Germany in 1935, when far-reaching agreement on many points of international importance was attained. The nature of lights carried by aeroplanes, the floodlighting of landing areas, and the colour and disposition of boundary and obstruction lights have been specified in detail. Aerial beacons and lighthouses are in some respects more complicated than those intended for ships at sea, in view of the fact that the observation of the light is not restricted to an approximately horizontal plane, but requires to be viewed and identified from a wide range of angles. Distinctive beacons mark out all the main aerodromes, but there is still some difference of opinion in regard to "blazing the trail" by intermediate signal-lights. In the United States, the marking-out of the vast overland routes in this way is a natural step. In this country, however, the inland routes are relatively small, whilst, in the case of routes traversing oceans and continents, a chain of luminous signals is impracticable. The tendency, therefore, is to regard aerial travel more from the standpoint of the navigator at sea, accustomed to pick his route by his own skill, his instruments, and his observations of the sun and stars.

In the air, as at sea, we find in radio-communication an invaluable adjunct to visible radiation, especially during periods of fog. There is also a third device—the laying, in the vicinity of the aerodrome, of a main carrying an alternating current, which can be picked up by instrument and followed to safety. In this sphere also, however, much time must elapse before signalling with light can be completely replaced by other means.

Low Voltage Neon

Displays of neon tubes in various colours are familiar in all large cities. Their use has been extending rapidly year by year, and the variety of effects obtainable is continually increasing. As is well known, however, such tubes ordinarily operate at relatively high voltages.

In his paper before the Illuminating Engineering Society on December 8th, 1936, Mr. Paul Freedman broke new ground by describing and demonstrating a form of neon equipment capable of being operated on ordinary service voltages.

Mr. Freedman's paper before the Illuminating Engineering Society, on December 8, was illustrated by a number of attractive demonstrations. At one point the audience were invited to traverse in procession the circuit of the lecture theatre in order to compare the relative brightness of low voltage and high voltage neon tubes as seen at close quarters, and from the back of the room.

The meeting was also noteworthy for the introduction of a form of Traffic Signal, operated by the President, to keep the length of speeches within bounds—though members were exemplary in this respect—and by the decision to accord the vote of thanks to the lecturer *before* the discussion, so that speakers successive might not feel called upon to occupy time by complimentary remarks! There is no doubt that an appreciable time was saved in this way.

In the introductory portion of his paper Mr. Freedman explained that discharge tubes applied for luminous signs and decoration were commonly described as "neon," though, of course, many contained other materials (e.g., argon, helium or mercury vapour). Such tubes normally required 500-3,500 volts per section, and sections were grouped so that the total voltage was about 10,000. Such high pressure involved special precautions, transformers, h.t. cables, etc. Care must be devoted to insulation and earthing, and it was necessary to give nearly every customer individual attention. Hence general distribution of high tension neon equipment through wholesale and retail distributors and standardisation of shapes and sizes of letters and decorations were impracticable. Hence the desirability of producing a low voltage type of neon which can be operated direct off the normal household electric supply.

Requirements for Low Voltage Neon.

The chief conditions with which such a low voltage neon system should comply are:—

(1) Ability to operate on A.C. and D.C. supplies of 100-150 and 200-250 volts.

(2) Simplicity of construction and a minimum (or complete absence) of auxiliary devices.

(3) Dimensions in accordance with the established requirements of industry. The prevailing demand is for tubes 10-11 mm., 15-16 mm., and 20-22 mm. in diameter.

(4) Operation at not more than 5 watts per foot, 7 watts per foot, and 9 watts per foot, for the three sizes of tubes mentioned above.

(5) A relatively high-power factor.

(6) Absence of high frequency oscillations (with a view to avoidance of interference with radio sets).

(7) Satisfactory colour and appearance. About 80 per cent. of existing tubes employ red-orange light, 10 per cent. blue, 5 per cent. green, and the remaining 5 per cent. various other colours (yellow, white, etc.). Ripple and scintillating effects may be no drawback, but a positive advantage if the effect is pleasing and not tiring to the eye.

(8) Adequate luminosity. This depends essentially on visual impression rather than values in terms of c.p. per watt, etc. The author has proposed that tubes should be rated, according to the Weber-Fechner Law, in terms of the logarithm of candle-power. The ideal brightness of a shop window display, viewed at close quarters, should be less than 6 per cent. of the same brightness viewed at a distance. It is suggested that a form of tube can be produced which would appear to an observer to be much brighter at a distance than at close quarters.

(9) Satisfactory life. High tension tubes often last for 5,000-6,000 hours, but it is unwise to guarantee a life of more than 2,000-3,000 hours. There is no reason to suppose that a longer life would be demanded for low voltage neon.

Three Lines of Investigation.

Investigations of the problem of low-voltage neon may be divided broadly into three classes:

(a) Discharge tubes operated by high frequence current derived from mains operating high frequency units.

(b) Positive column discharge tubes operating at household supply voltages, possessing hot cathodes of high electron emissivity, starting means, and auxiliary means of ionisation of the positive column region.

(c) Negative glow discharge tubes operating at household supply voltages.

High Frequency Effects.

Of these, the first method is the oldest, and the author, in the original paper, quotes researches by a number of different workers in this field. Such methods should not be described as "low voltage" neon, since, in fact, the high frequency effects take place at relatively high voltages; but the absence of danger of shock associated with high frequency currents has led to the use of this term to indicate that it was "safe." Various difficulties have been encountered in the course of development of high frequency neon. High frequency currents are difficult to insulate even in a dry, warm room, and much more so outdoors where the installation may be subject to damp, fog, rain, or snow. There is, of course, no danger of electric shock, but the minute high frequency spark and brush discharges are objectionable. Moreover, high frequency neon is prone to act as a source of serious radio interference.

Some researches have encouraged the belief that efficiencies could be obtained, but the author suggests that this was possible only under very favour-

able conditions. The power factor may be as high as 0.6 or 0.7 but this is offset by the necessity of precautions to guard against radio interference. The high frequency oscillator, and the problems of insulation and screening, also introduce inconvenient complexities.

Hot Cathode Tubes.

Positive discharge tubes operating with hot cathodes were next discussed. The length of tubes for floodlighting is under 3 ft. and the consumption 120-170 watts per ft. of positive column, whilst the efficiency varies from 9 to 12 lumens per watt, accordto the colour. The uncorrected power factor is about 0.3, and the tubes are designed for use on 200-230 volt A.C. circuits. Various devices to achieve a relatively low voltage are described. Some forms of construction lend themselves well to the design of individual letters, and a wide range of colours is obtainable. The chief drawback in such cases is the large number of carefully balanced chokes necessary. The hot cathode positive column tube, whatever other merits it may have, does not seem to promise an ideal solution so far as low voltage neon for sign and decoration purposes is concerned.

Negative Glow Tubes.

Negative glow tubes were next discussed by the author in some detail. Such tubes developed from 1917-18 onwards, form a more recent line of research. The most successful of the earlier lamps utilised electrodes stamped out of sheet metal, in the form of various letters, devices, and silhouettes. Drawbacks were the restricted size of the luminous element and the low brightness attained. Later forms of tubes utilising parallel wires or metal spirals were introduced. Difficulties were the patchiness of the light, which tended to concentrate in small regions of the tube where the discharge first was initiated, the inability of working some designs into any but very elementary shapes, and the relatively weak luminosity attained.

A form of tube introduced by the author made use of spirals of iron wire supported by pyrex insulators. The best spiral diameter, corresponding to the appropriate pressure of gas, was found to be 3.7 mm. In such lamps neon gives a more orange coloured light than that obtained from positive tubes, whilst mercury argon is a paler blue. Green, white, and other colours were obtained by using a mercury argon discharge in Fischer glass tubing. Such tubes operate well on both A.C. and D.C., though, in the latter case, the glow is naturally confined to one electrode. Consumptions ranged from 7.5 to 10 watt per ft., according to the length of the tubing.

At close quarters the effect is much softer than is the case of high tension neon. At a distance of 100 ft., however, the visual effect is very little different in the two cases. In the appendices to the original paper performance data for various tubes were presented. Thus, one lamp operating on 186 volts and consuming 34 watts, furnished 2.7 horizontal candlepower. A power factor of the order of 0.9 has been noted. A life varying from 2,000 to 5,000 hours may be anticipated. Owing to the fact that the hardening of such tubes is not so marked as in the case of high tension neon, one can construct tubes exhibiting novel luminous effects by adding impurities or reducing the gas pressure somewhat. In this way pleasant scintillating effects can be produced, and some of these were exhibited at the meeting. It was also pointed out that by varying the value of the current-limiting resistance in series with the tube the glow can be caused to expand or contract over the tube length in a similar manner to that observed in high frequency "writing neon."

Future Possibilities.

Reviewing future possibilities, the author suggested that there was still room for experiment and improvement. It would, for instance, be desirable to produce tubes capable of operating at 100-120 volts, and it might be desired to increase the luminosity somewhat—a condition that might be realised by employing electrodes of higher emissivity than iron.

The Illuminating Engineering Society of Australia (New South Wales)

The annual report of the sectional Australian Illuminating Engineering Society with headquarters in New South Wales shows that good progress is being made. In constitution and method it resembles the British Society. It includes eleven sustaining members in its list.

An innovation is the decision to issue certificates to all full members and sustaining members. This step has sometimes been suggested in this country. Is it expedient? We rather question whether such a certificate would be demanded or valued by many members here—unless and until it carries with it some qualification of proficiency in illuminating engineering.

The list of papers (eight in number) during the past session was again a varied one. The "Open Commercial Night," held in August, evidently fulfils a similar function to the opening meeting in this country, as it affords an opportunity for the display of new equipment.

Last November the Society held its first annual dinner, which was quite successful. The provision of light refreshments after each general meeting has also proved a popular innovation.

N.P.L. Publications

The attention of readers may be drawn to the following two papers on photometry, which appear in a list of papers published by the National Physical Laboratory:—

"The Elimination of Errors Due to Stray Light in Spectrophotometry." By J. S. Preston, M.A., A.M.I.E.E., F. Inst. P. Published in the "Journal of Scientific Instruments," Vol. 13, p. 368.

"A Photoelectric Spectrophotometer of High Accuracy." By J. S. Preston, M.A., A.M.I.E.E., F. Inst. P., and F. W. Cuckow, B.Sc. Published in the "Proceedings of the Physical Society." Vol. 48, p. 869.

Obituary

NORMAN MACBETH.

In the recent death of Norman Macbeth the American Illuminating Engineering Society lost one of its charter members and past presidents, who had taken a keen and active part in its work for many years. He was greatly interested in photometry, and his name was familiar in this country through the illumination-photometer produced by him in 1914. Mr. Macbeth should also be remembered for his work as owner and editor, during 1912-1917, of the "Lighting Journal," the only publication in the United States exclusively devoted to the advancement of the lighting industry.

Colorimetry and its Relation to Photometry

IN his address on the above subject to the Section on Photometry of the Illuminating Engineering Society, which took place at the Borough Polytechnic on November 24, Mr. J. Guild emphasised that the increasing use of coloured lights for various industrial and commercial purposes was bringing the illuminating engineer into closer and more frequent touch with the colorimetrist. Points of contact were the use of colorimetric formulae in specifications relating to certain illuminants, and the special difficulties arising in the technique of photometry of modern lamps yielding varied types of spectra. The object of the paper, therefore, was to explain the fundamental principles of colorimetry.

This was done by Mr. Guild in a very able manner. One important point emphasised early in the lecture was the possibility of colours identical visually being in fact composed of distinctly different qualities of radiation. Mr. Guild explained in detail methods of specifying and recording colours in terms of three standard colours, such as red, green, and blue, for which arbitrary scales can be established, and relations expressed in terms of equations embodying the red, green, and blue sensations. Colorimeters based on this principle were exhibited and described. It was also explained how colours could be judged in terms of hue and saturation, and how specific tints could be matched by mixtures of white light with light of the primary colours. In the later portion of the lecture Mr. Guild showed how, by the aid of the trichromatic instrument, practically all photometric problems could be tackled; it served, in fact, as a universal heterochromatic photometer. The method of presenting the luminosity throughout the spectrum of an illuminant was explained, and, likewise, the framing of relations enabling the "visibility factor" to be calculated. A feature of the address was the explanation of the operation of the Maxwell colour-triangle, and the ingenious projection of a luminous triangle in three superimposed colours, by means of which the principle can be illustrated in a very vivid manner.

Members present listened attentively to this informative address, and there was a keen discussion, which led to the meeting being extended beyond normal limits. Mr. G. H. Wilson asked for Mr. Guild's opinion on the use of filters in connection with the practical problem of testing coloured glass for compliance with the Standard Specification. The usual colours met with in routine tests were red and green. The former, being a saturated colour, could be dealt with on straightforward lines, but green was usually more difficult. Mr. J. G. Holmes, who expressed the regret of Dr. W. M. Hampton at being unable to attend, referred to the recent improvement in the accuracy of the spectro-photometer which had enabled specifications on the X.Y.Z basis to be applied with reasonable confidence. Some reference had been made to use of physical photometers, but he felt that such instruments as the Guild colorimeter were sufficiently rapid in use, and accurate for all ordinary purposes. He wondered whether there was any authentic form of physical spectro-photometer available sufficiently accurate for colour computations. Professor Hardy seemed to have used a substandard C in recent work, instead of the equi-energy system, giving an entirely different set of values for the triangle. This did not coincide with the view set forth in Mr. Guild's 1932 paper.

Mr. C. A. Morton emphasised the convenience in use of the X.Y.Z system and recounted some experiences of measurements of signal glasses. He asked for fuller details of the measurement of saturation and wondered whether the diagrammatic method of representation shown would be standardised.

Mr. G. T. Winch emphasised the time occupied, and the difficulties in manipulation and calculation with direct visual colorimeters, and suggested that methods based on the use of photo-electric cells might prove successful in many fields of work. He would like to hear Mr. Guild's views as to their possibilities and limitations. It would be very convenient if a photo-electric colorimeter giving direct readings on a diagrammatic basis could be devised, and he sketched a possible arrangement based on the use of three galvanometers receiving impulses from the three groups producing intersecting lines on the colour triangle.

Mr. J. M. Waldram said that the trichromatic method was the only complete one for specifying colours. He wondered whether all colours could be represented by the "hue and saturation" method, and, if not, what degree of limitation was involved?

Mr. F. E. Lamplough mentioned the difficulty of getting good quality green glass. Mr. J. S. Dow pointed out some of the inherent difficulties of colour-photometry, due to the physiological peculiarities of the eye, which no system of spectrophotometry could completely overcome. He also suggested the avoidance of "visibility ratio" in the sense adopted by the author. "Luminosity ratio" would be preferable.

Mr. H. Buckley, who presided, referred to the difficulties involved in having to assume the existence of a standard observer working with a standardised spectrum. Difficulties had been experienced in the photometry of colour signal glasses and electric discharge lamps in the laboratory, where variations in the observers' estimates of candle-power could not be satisfactorily related to their Y—B ratio.

Mr. J. Guild, replying to Mr. Wilson, explained, by reference to a diagram on which the colour triangle and spectrum line were plotted, how red and yellow signal glasses gave fairly saturated colours. Green, however, would have to be unsaturated in order to transmit sufficient light, and in practice hue and saturation varied considerably. It was always difficult to form a mental estimate whether the saturation of a sample was greater or less than that of limit glasses. The accurate recording instrument mentioned by Mr. Holmes would doubtless become available in this country when someone was prepared to pay the cost of installation. It was an expensive instrument.

Mr. Guild explained that spectrophotometers were more accurate than visual colorimeters in that one could get a definite result as close as need be to the standard observer. With opaque materials it was, however, difficult to get enough light to use a spectrophotometer and the only satisfactory course was to use a visual colorimeter.

The hue and saturation method could be used with respect to any white, but as recommended in this country and America, the equi-energy spectrum could be taken as white.

The advantages of the trichromatic system were that one could get fundamental results and could calculate the results of any other system. The fact of observers' eyes not being standard was always a difficulty. It was, however, possible to get numerical relations between quantities of light of different colour, which in some circumstances would look alike.

Some Impressions of the Lighting at the Empire Exhibition, Johannesburg

(SPECIALLY CONTRIBUTED)

The Tower of Light—Lighting of the Pavilions—The Great Arena—Johannesburg by Night

Modernity characterised the lighting features of the 1936 Empire Exhibition, Milner Park, Johannesburg.

A visitor's impression of the South African "Wembley" by night is of light which gives a gay effect while avoiding any suspicion of being garish.

The Empire Exhibition was illuminated mainly from concealed lighting points, and the lighting of all objects appears to be in keeping with the artistic style. The interior of the halls was lit by strips of lamps hidden in troughs which are hung up below the velarium ceiling, or from stand lamps with an inverted cone reflector, throwing the light against the velarium, by which it is evenly diffused and reflected.

The Exhibition was treated primarily as a whole, a comprehensive scheme being adopted to accentuate special features. Secondary lighting showed up the architectural features of the buildings. At special points tertiary lighting was employed.

The principal feature of the Exhibition was the beautiful layout of its grounds and gardens. Something quite different from a circus effect was desired, and fairy lamps and huge pylons, which had this tendency, were ruled out.

Milner Park, scene of the Exhibition, was planned as a single unit of golden light, restful to the eye, and at the same time dignified. The whole interior of the pavilion was illuminated artificially, about 2,500 electric lamps, ranging from 15-watt bulbs to those of the 1,000-watt projector type, being used.

As usual in exhibitions, the final shape of buildings, pavilions and stands was determined only shortly before the Exhibition opened.

A great volume of work had to be done by the Exhibition's Electrical Engineer, not only to carry out the plans previously detailed, but to arrange all the last-minute alterations and additions, which even had to include constructional work on the buildings in order to install the lighting equipment.

The use of buildings, trees, etc., as diffusing reflectors is a rather uncertain factor, depending upon the final paint, the weather conditions, and the final lay-out of the grounds.

Additional lighting had, therefore, to be installed here and there, especially in places where the Exhibition had relied on floodlighting effects expected from private pavilions.

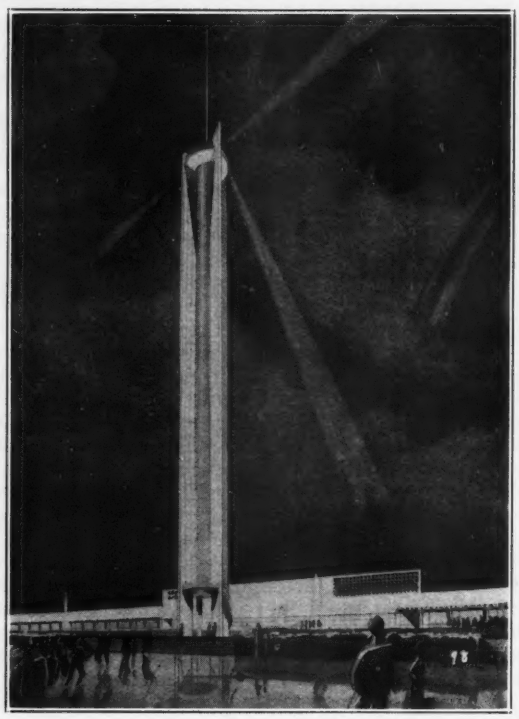
The Empire Exhibition consists of more temporary buildings than usual in overseas exhibitions, and buildings of a temporary structure are naturally erected at the last minute.

As it had been decided not to install an independent street lighting system and to rely on the floodlighting effects instead, the necessity of a few improvements was fully realised. It is notable that these improvements did not exceed 0.5 per cent. of the total costs of the electrical and lighting budget.

The Tower of Light.

An attractive and spectacular feature was the tower of light, which was erected by the Electricity Supply Commission in co-operation with the Exhibition authorities, the Victoria Falls and Transvaal Power Company, Limited, and the Pretoria Portland Cement Company, Limited. The tower, constructed of reinforced concrete, was bathed in soft light, fitting it like a coat. The tower is visible from a considerable distance. It was 150 feet high and is circular in shape, with an external diameter of 12 feet and an internal diameter of 10 feet. From the ground to the top of the tower run four tapering fins. There was a platform round the outside of the tower—16 feet from the ground—and above this level, inside the hollow tower, was a searchlight of 4,000,000 candle-power. The beam was reflected by a mirror inside the tower straight up to the sky. The whole of the tower was illuminated at night by a bank of 32 floodlights, the power being 32 kilowatts.

During the day 141 kilowatts of electricity were in use in the pavilion, and a total of 47 kilowatts



The 200 feet Central Tower of the Empire Exhibition, erected by the Electricity Supply Commission and the Victoria Falls & Transvaal Power Company. Its searchlights were visible the entire length of the Rand.

was used in the evening for flood lighting the exterior. It was estimated that 1,600 units of electricity would be consumed per day. For wiring the installation over four miles of cable was necessary.

Pay boxes and turnstiles at the main entrance were lit by a series of opal tubular lamps. A band of amber-coloured hue formed a canopy above this semi-circular building. The canopy supported flood-lit flags and shaped pylons radiating colours of the rainbow.

Emergency Lighting.

Early consideration was given to the question of emergency lighting of a magnitude not usually associated with emergency schemes. It was decided to provide an entirely isolated network to supply independent points in the several pavilions, so guarding against both local and external features. Pro-

vision was made for fully illuminating the main dancing, restaurant, and skating halls.

The pylons illuminating the main avenue at Milner Park consisted of a square base with a 150-watt lamp placed behind opal glass, and two intersecting boards forming four right-angles, each of which were filled with colour-sprayed lamps. V's were thus formed, and behind a small carrier in the depths lights were mounted. Carrier and intersecting boards were arranged to hide the lamps and at the same time reflect and diffuse the light on to the whole upper surface of the pylon.

These units were approximately 10 ft. high—sixty were employed to illuminate the main avenue alone. The load (1 kw.) was made up of one road lighting lamp and twenty-one colour-sprayed lamps (the latter for effect only).

Ingenuity and experience combined to provide effective lighting of the buildings, both inside and out. In view of the large amount of inflammable material employed it was thought expedient to adhere rigidly to standard regulations for permanent installations. All distribution boards were composed of iron-clad gear.

The United Kingdom Pavilion.

Visitors to the United Kingdom's Government pavilion had the world at their feet. In the centre of the pavilion they looked down on a giant map on which models of British merchant ships moved through actual water on the world's trade routes. Principal Imperial air routes were shown by means of a new form of illuminated tube.

Overhead, in the dome of the rotunda of the pavilion, the constellation of the Northern Hemisphere had been painted, and stars, represented by electric bulbs, waxed and waned as night and day followed in turn. Ingenious hidden lighting gave added realism to the series of panoramas in the wings of the rotunda.

A 60 ft. pedestal, surmounted by a globe, representing the gold output of the Johannesburg mines for a period of three years, was the main feature of the Chamber of Mines exhibit. Two spotlights were used for picking out the globes. For lighting the pool which surrounds the base of the pedestal two spotlights were used.

Special laylights were supplied for the interior of the pavilion, for which approximately 1,000 lamps were used.

Two floodlights mounted on 20 ft. poles and equipped with 1,000-watt lamps were used for the Western Province exhibit.

The Electrical Pavilion.

Leading United Kingdom manufacturers interested in the South African market took the Beama-Cma Electrical Pavilion. The building occupied a space of approximately 12,000 square feet. The illumination scheme in the pavilion was interesting in that architectural or light tubes were used to supply general lighting.

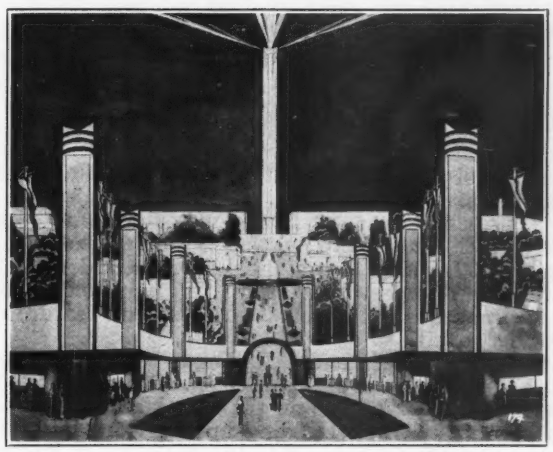
A plain velarium stretched longitudinally below the supporting girders of the roof. Transversely across the pavilion, at approximately 15 ft. intervals, continuous strips of light tubes were arranged covering the full width of the hall in alternate 6 ft. sections of white and yellow tubes. The transverse strips of light were then terminated at each side wall in an artistic corbel of curved orange tubes symmetrically arranged on a decorative strut fitting. The combination of colours and controls brought into effective relief and harmony the general and uniform colour schemes adopted for the pavilion and stands, and at the same time afforded an illumination of 5 foot-candles at stand level. The following firms designed co-operatively the illumination scheme in this pavilion: The British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and the General Electric Co., Ltd.

It was decided that lighting of the lake should consist of 40 units, made locally and giving luminous spots between or beneath the water-lilies and other natural attractions in which the lake abounds. A cascade of water plunged from the top of the adjoining rockeries into the lake, and troughs of lights built in each of its four steps illuminated the falling water. Fifty coloured lamps, in waterproof bulkhead fittings, displayed the beauty of the rockeries.

Lighting of the Arena.

The arena was used as a large outdoor theatre during the period of the Exhibition. The southern half of the grounds surrounding the arena was covered by temporary stands, providing additional accommodation. A stage, six feet above ground level, with the necessary wings and side scenery, had to be erected. The width of the open-air theatre exceeded 500 ft. Illumination problems proved of exceptional difficulty, owing to the breadth and the impossibility of placing the usual battens, floodlights, projectors, and spots inside the actual stage area. The main portion of the installation had to be placed opposite the stage, and the throw of the light had, therefore, to overcome a distance of at least 200 ft.

1,500-watt floodlights of the Blaizolite type were decided upon for the general floodlighting of

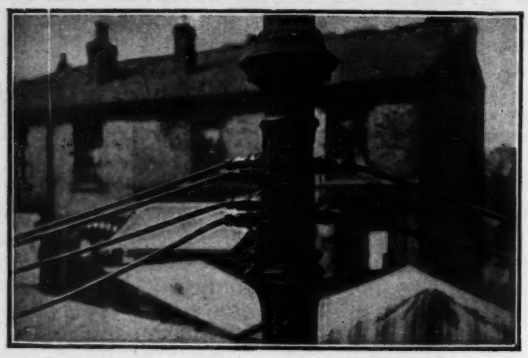


An artist's impression of the Main Entrance by night.

the arena. These Blaizolites contain an elaborate system of lenses and mirrors, allowing a wide adjustment of the throw, at the same time preventing any glare. In addition, spotlights fitted with 80-amp. arc lamps were used to pick out soloists. A three-colour scheme illuminated the actual scenery. Any effect desired was thus obtainable. A number of cloud projectors provided the sky effect on the background. The whole equipment was controlled and operated from a stage dimmer switchboard, consisting of about 45 dimmer circuits.

Electrical Statistics.

254 miles of V.I.R. and 15,000 globes were installed in the grounds. Some months previous to the opening of the exhibition, the supply of electrical power was estimated at 4,000 kVA. Later, the installed transformer capacity was increased from 4,000 to 5,000 kVA, and while in the first instance an ample margin was left for contingencies, it was later feared that the overload capacity of the installation would be called upon during peak load periods. The Great Britain Pavilion required 250 kw; Canada, 230 kw; Rhodesia, 100 kw; and other pavilions each up to a maximum of 350 kw. The number of sub-stations was increased to five, two having a capacity of 1,500 kVA each. The main supply to the Agricultural Show Grounds, in which the Exhibition was held, was 3,300 volts, 2-phase, the low tension reticulation being single-phase, 3-wire. The capacity of those municipal feeds was found to be inadequate



A "Niphan" market lighting installation, showing main feeding sockets fitted to a lamp standard.

MARKET LIGHTING with the NIPHAN System

FOR some years we have been collaborating with public lighting authorities in devising temporary lighting installations for market stalls. The picture shows part of a "NIPHAN" market job, in which 6 sockets, in conjunction with a fuse board, were mounted on a lamp standard, with plugs leading to 3-way tees and suspended through sockets.

● Our extensive market lighting experience is at your disposal.

Announcement of SIMMONDS & STOKES Ltd., Victoria House, Southampton Row, London, W.C.1. Tel.: Holborn 8637. 'Grams: "Niphon, London."

NIPHAN

for the anticipated load, and it was decided that the municipal connection should consist of three 0.25 sq. in., 6,600 volt, 3-phase feeders terminating in 250,000 kVA switches.

Johannesburg at Night.

The Empire Exhibition was concurrent with the golden jubilee of the city of Johannesburg, and lighting features indeed made it a "golden city." Johannesburg at night recalled the floodlighting that made London a city of wonder at the time of the Jubilee of his late Majesty. A golden way to the exhibition was provided

Approximately 6,000 lamps were devoted to the City Hall. White strip lighting was employed except on the west side facing the Library Gardens with green and gold strip lighting. A neon golden ball which appeared to revolve was a special feature on the City Hall.

Two "Jubilee" and "Jubileum" signs 110 feet long were in green and gold neon. Other "Jubilee" and "Jubileum" signs on the City Hall tower were in gold sign lamps, building up the word letter by letter and then commencing the cycle again. Sodium floods gave a golden spreadlight behind the colonnades.

The Library east face was floodlit in white with 20 1,000-watt projectors. The gardens were festooned in green and gold strip lighting. There were approximately 8,000 lamps.

The Cenotaph had white floodlighting, while there was strip lighting in green and gold for the jubilee arches, the jubilee dates and city crest being outlined in neon.

Down the centre of Eloff-street—principal street in the city—gold strip lighting gave a magnificent effect. The 13 centre tram poles were fitted with decorative illuminated boxes bearing crests. The pole lighting was in green and gold strip.

The Scottish Memorial was floodlit in white, as was the south face of the Art Gallery, 15 1,000-watt projectors being used in the latter case. The north face buttresses of the Art Gallery were in sodium golden light. The courtyard and palm were floodlit in green with gaseous discharge lamps.

At the Yeoville Reservoir ball tower, the ball twenty-six feet in diameter, was strip lighted in gold. Approximately 600 lamps were employed.

Contrasting in appearance to the large golden ball in the sky, the Airway Beacon was erected on the roof of Helvetia Court, Yeoville, behind the Reservoir tower. This was a modern development in occulting beacons for airway uses. The high intensity lamp was housed in a sphere of glass 36 inches in diameter. Through the medium of lenses the maximum beam output was 1¼ million candle power. The beacon had seven revolutions per minute. The main beam was white and under favourable conditions was visible for about fifty miles. Three sections of the glass sphere, however, had been painted red, green, and blue.

The main route to the Empire Exhibition was made golden by sodium gaseous discharge lamps.

Sixty-five floodlights in green and gold and ten gaseous discharge floods illuminated the willow trees at Zoo Lake Island. The water fountain, erected at the north end of the island, was illuminated with various coloured lights operated by means of a motor-driven controller

Credit for the success of the illumination features of the Exhibition was largely due to Mr. H. R. Klein, the Illumination Engineer, and Mr. C. L. de Beer, A.M.I.E.E., Dipl.-Eng., the Electrical Engineer.

C. L. E.

Notes on Gas Lighting

A recent ten-year contract affecting certain main roads in the suburban area of Gloucester should bring the lighting up to the "30 m.p.h." standard. Four-light gas lamps with the latest directional reflectors are to be installed. The standards are to be extended to bring the lamps to a height of 15 ft. above road level, and will be in staggered formation at intervals of not more than 50 yards. The number of lamps (164) may be increased shortly, as the Hucclecote Parish Council has approved the extension of the lighting to the outer area of the parish.

About 410 gas lamps are involved in the renewal of the contract for public lighting by the Bromsgrove Urban District Council, where various improvements are being carried out. New contracts for gas lighting in rural areas affect the villages of Bingham (Notts), Greatham (Northumberland), Staverton and Hilperton (Wilts), Misterton (Yorks), Wimborne (Hants), Kennoway (Fife), and Brigg (Lincs).

Work has started on the installation in the Sevenoaks area of over 170 extra gas lamps. Existing lamps are also being improved by new fittings, and the work, which is expected to be completed in March, will greatly improve the lighting of a number of main and side roads in the area.

About 384 street lamps are involved in a renewed contract for gas lighting made by the Johnstone Corporation. The Corporation Gas Department has also secured contracts with the Renfrewshire County Council for gas lighting in the districts of Homewood, Brookfield, and Elderslie.

A new contract for low pressure gas lighting has been entered into by the Greenock Corporation. This is for public lighting on the Strone Farm Housing Estate, on which seventy-seven lamps are provided.

On the municipal estate at Dartmouth 251 houses are to be equipped with gas for cooking, home laundry, and lighting. Public lighting on the estate will also be by gas.

Some Notes on Recent Lighting Progress in Australia

We are indebted to Mr. A. P. Turnbull and Mr. L. Lord for these notes on developments in Australia. Readers will learn with pleasure of the rapid progress towards complete economic recovery. The illustrations relate to new work on the N.S.W. Railways, with which Mr. Turnbull is himself associated.

As was predicted in public utterances by those in a position to know in the "Old Country," Australia has made a phenominally rapid recovery from the recent economic depression. This is amply demonstrated by the progress made in the application of lighting to industry, the home, and amusements.

Building activity has been maintainel in a remarkable degree during the past year. Public buildings, office blocks, flats, and theatres have been erected or brought up-to-date, and, in many cases, built-in lighting has been successfully applied. Prominent amongst these installations in Sydney are the Wynyard Railway Restaurant, the showrooms of

Showing the new Holophane box-fittings at Wynyard Station, Sydney.

the Sydney County Council Electricity Undertaking, and the Trocadero Dance Hall. In Melbourne, the Manton Restaurant and the Windsor theatre have made attractive uses of built-in and built-on lighting. In the case of these installations, the architects from the beginning, designed in close collaboration with the lighting engineers. In the case of the Wynyard Railway Restaurant, which depends upon artificial lighting entirely, the architects practically used light as their foundation.

Effective working relations between architects and illuminating engineers are gradually being established: this has been due in no small measure to the

N.S.W. Railway's New Administrative Buildings. Ground Floor Lift Entrance.

work of the Illuminating Engineering Society of Australia which organised joint meetings between the Institute of Architects and the Society. The mode of operation, in most cases has been the employment of engineer-salesmen of the equipment or supply concerns to assist in the preparation of lighting plans.

The introduction of the gaseous discharge lamps was followed by considerable interest on parts of councils and industrial concerns, and many trial installations have been erected in the principal centres as a result of which large outlays for this form of lighting are expected. The coiled-coil lamp has increased in popularity, and has enabled the standard of domestic lighting to be materially raised.

The "All-Electrical Exhibition" at Melbourne last year provided many opportunities for demonstrating to the public the varied uses of light for both industry and decoration. Full advantage was taken of these possibilities by the Exhibition Committee and the principal exhibitors, as a result of which many effective lighting demonstrations were provided. One half of the space was transformed into a huge garden and, daylight being totally excluded, many forms of garden lighting were effectively applied, including mobile coloured fountains and cascades. The various stalls were all linked by the method of architecturally lighted decoration which had been evolved by the architects in association with members of the Illuminating Engineering Society. Many local supply authorities are now planning and holding their

A Corridor in the Administrative Buildings. Box ceiling fittings are again in evidence.

own exhibitions in conjunction with the electrical trade, and as a result of these efforts much good lighting propaganda will be spread.

Outstanding amongst local celebrations is the South Australian Centenary, while extensive plans are being prepared for the Coronation and the 150th anniversary of the founding of Australia. These occasions will present great opportunities for civic festival lighting, and committees of lighting and decoration experts are being formed to deal with the matter.

In the realm of night sport, increased interest in lighting is being shown, and many tennis courts, bowling greens, dog-racing tracks, and swimming pools may now be used after nightfall. The new Olympic Pool at Sydney is a splendid example of modern under-water pool lighting. But the possibilities of gardens and parkway lighting have as yet scarcely been touched upon.

In a brief outline such as this it has not been possible to mention details of the various applications of lighting to the outstanding installations in Australia; it will suffice to say that the men responsible watch every development in overseas practice, but at the same time, being imbued with the pioneering spirit of lighting progress, they are able to introduce innovations to better satisfy local conditions.

Gatwick Airport: Further Particulars of Lighting Equipment

In our last issue, brief mention was made of the visit of members of the Illuminating Engineering Society to Gatwick Airport on November 17. In what follows we give some further particulars of the equipment.

The limited party that it was found possible to admit to the control room found much of interest apart from applications of light. The chief control officer explained the system of logging the approach of aircraft, noting their progress from place to place, and preserving a detailed record of the various stages after relinquishing wireless control and first sighting the craft, down to the landing and final guidance to the allotted berth at the station. The latter is conveniently indicated to aircraft by a luminous direction sign controlled from the tower. The Lorenz apparatus for the automatic guiding of pilots when flying in fog or low cloud, and which operates over a considerable zone round the aerodrome, was described. In the case of a crash, an emergency switch brings into operation a syren, and this calls the staff to run out the fire engine and ambulance that are always ready. The control room is in constant communication with Croydon, as well as the various Continental aerodromes to and from which the British Airways are operating.

An interesting lighting development demonstrated was the portable signalling light used for guiding in the aircraft when close to the landing ground. In this hand lamp a powerful and very concentrated beam is produced. The lamp is equipped with a shutter for signalling with the normal white light and also with screens for showing red and green when it is necessary to use these colours for signalling to aircraft arriving or departing.

Some particulars of the Chance reflector floodlight have been furnished by Dr. W. M. Hampton, to whom

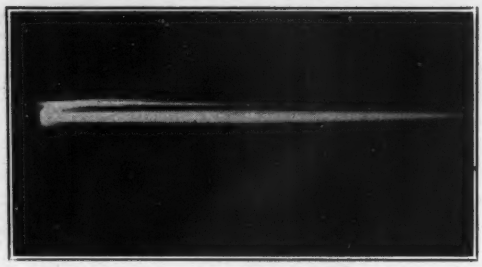


Fig. 1. Showing the effect of a very narrow beam.

we are also indebted for the accompanying illustrations. This floodlight is built up in units each containing 1½ kw. lamp. In the case of Gatwick, these lamps are 210 volt and have a horizontally mounted flat grid filament. This filament grid is mounted at the focus of large mirrors, which are parabolic in the vertical section and circular in the horizontal. They form, in effect, the surface of revolution of a parabola rotated about a vertical axis through the focus of the parabola. This type of mirror gives a small vertical divergence and a wide horizontal divergence. In front of the lamps, in order to prevent stray light and the direct light of the filament reaching the eye of a pilot, and in order to increase the intensity in the horizontal direction, there are mounted small spherical mirrors. These mirrors are

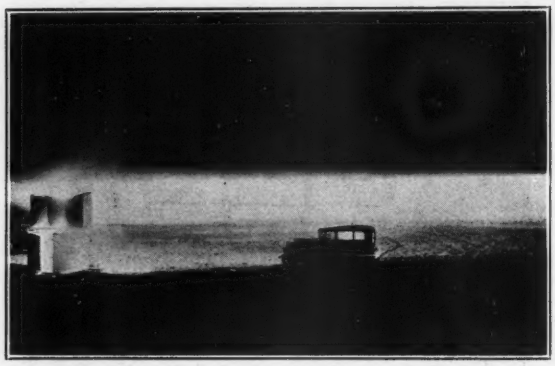


Fig. 2. The Floodlight applied to the general lighting of the landing ground.

decentred so that the image produced is, in effect, a continuation of the filament itself. Theoretically, with no reflection losses, this arrangement should give three times the intensity in a direction normal to the plane of the system; owing, however, to interference from the lamp bulb, and so on, the actual figure is about 2.2 times the initial intensity.

Each of the floodlights at Gatwick consists of four such units, with the axes suitably disposed to illuminate a large horizontal region. Owing to the wide horizontal spread of each unit the beams overlap, and as each unit gives approximately 400,000 candles the floodlight, as a whole, gives a candle-power in the neighbourhood of 1½ millions. The area illuminated by each floodlight is approximately 100 acres to a figure higher than 0.15 foot-candles.

These floodlights are all controlled from the control tower of the aerodrome, so that the appropriate unit can be lit in accordance with the prevailing wind.

The pictures give a good impression of the power of the floodlights in illuminating a large area. The lights were left on whilst the train was leaving Gatwick railway station, and the party were thus afforded an excellent opportunity of judging the effect from the carriage windows.

Progress in Illumination

Some Further Notes on the Exhibits at the Opening Meeting of the Illuminating Engineering Society, on October 13, 1936.

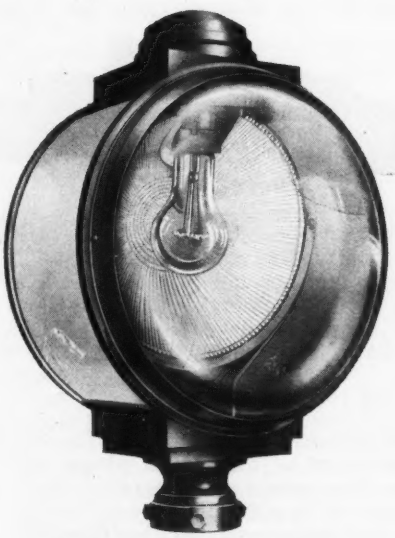
(Concluded from P. 376, December, 1936.)

A New Ceiling Unit.

This unit, which was demonstrated by Mr. E. Stroud (Holophane, Ltd.), is suitable for modern flats and offices which, in many cases, call for a close ceiling or a semi-recessed fitting. It carries on its outer surface very shallow diffusing flutes, and on its inner

A Holophane Stepped Ceiling Unit.

surface, stronger diffusing prisms, which are arranged "out of step" with one another so as to produce nearly uniform brightness. The two steps in the base carry similar diffusing prisms and flutes, and are strongly illuminated by the light reflected from an interior polished reflector of ellipsoidal contour. The central and lowest step of the fitting is a lens which also carries a special pattern of diffusing prisms. This lens, which can easily be removed to permit of lamp renewals, gives a fairly concentrated



An Ornamental Floodlighting Unit.

light over a wide area below the unit, while the body of the unit gives a pleasant diffused light of a general character.

Holophane Bi-Way Refractor.

The Holophane Bi-Way Refractor, recently illustrated in these columns, which is suitable for use with 400-250-watt and 150-watt mercury discharge lamps, was also shown. This is of single piece construction, and has three special features: (1) A smooth outside surface of the body of the refractor, except for a series of vertical reflecting prisms covering the quadrant on the "house" side; (2) Diffusing main beams at 160° to each other, obtained by the use of special refractor-diffuser prisms on the inside; and (3) Provision for some light which ordinarily escapes along and above the horizontal, to be controlled by means of a few horizontal prisms around the upper part of the refractor. The main beams are so controlled as to produce a maximum intensity at about 15° below the horizontal, thus producing a high surface brightness on suitable surfaced roads. without excessive glare.

An Ornamental Floodlighting Unit.

A new Holophane floodlighting unit with a special concentrating prismatic reflector is also illustrated. This permits of general service lamps being used in the normal "cap up" position. The reflector is carried within a glass housing, the back and sides being of white or coloured opal glass, and mildly illuminated by the light passing through the prismatic reflector. The front is of bent clear glass. The reflector is mounted in an adjustable frame so that the direction of the concentrated beam may be varied without destroying the symmetrical appearance of the unit as a whole. When used in a standard flood lighting casing, a special lens has been designed to co-operate with this reflector in such a way as to produce an asymmetric rectangular beam, such as is required for the uniform lighting of a column from a point quite close to its base

A New Spotlight Lantern.

Mr. F. P. BENTHAM (Strand Electric and Engineering Co., Ltd.) remarked that hitherto stage spotlights

A New Spotlight.

in this country have, in general, used the simplest of optical systems—a plano convex or a step lens with a lamp mounted at a variable distance from it,

and a fixed focus spherical reflector behind the lamp. Such a lantern gives not only an inefficient light, but also incomplete control over the light beam. The spot is either one size or another, but variation in shape is absolutely impossible.

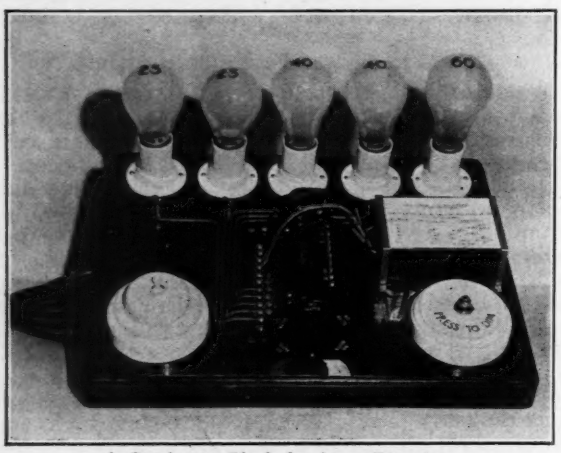
The new "Mirror" Spot here illustrated has been designed to remedy both these defects, without increasing the size of the lantern.

An 8-in. diameter silvered glass or Rhodium plated metal mirror projects the filament light as an intense beam through a gate, which is focused by a 6-in. diameter step lens. As the gate is fitted with adjustable framing shutters any size and shape of spot is easily obtainable. Devices are incorporated for accurate centring of the lamp filament, which, once set, all further adjustment is carried out from the framing shutters.

In the event of masking the gate down to a small aperture, the knob under the lantern may be pushed forward, bringing the lamp and reflector nearer the gate, thus passing more light.

A Condenser Block for Lamp Dimming.

Mr. Harold Bright was responsible for several interesting novelties. He showed that paper dielectric condensers connected in series with metal filament lamps form a very convenient means of dimming them on alternating current circuits. The capacity must be correctly proportioned to the wattage of lamps to be dimmed, and, on a 230-volt circuit, is approximately one microfarad per 25-watt lamp to be



A Condenser Block for Lamp-Dimming.

dimmed to 10 per cent. of normal brilliance. The condenser block shown contains three capacities, so proportioned that, by connecting them in different ways, loads of 25, 40, 50, 60, 80, and 100 watts may be dimmed. Its chief application is for hospital ward lighting, where a two-way and off switch in conjunction with the condenser block is all the apparatus needed The advantages over resistance dimming are that there is no heat to dissipate, and the condensers are undamaged by overloads. The demonstration model shown, by means of a barrel switch, enabled the various loadings and connection changes of the condenser block to be made automatically.

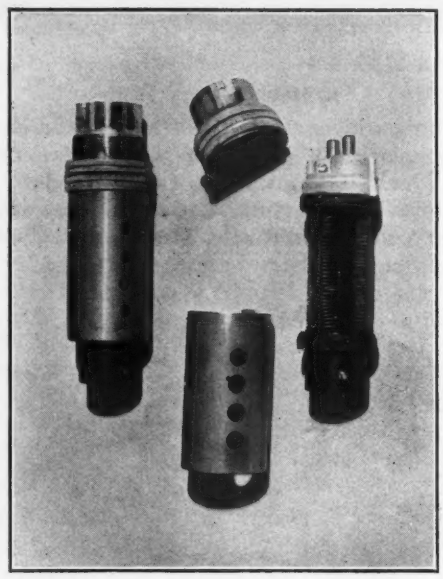
The "Rockit" Lamp.

A novel type of switch lampholder was also shown, in which the switch is caused to close by rocking or knocking the lamp standard. It is intended for bedside lamps and table standards and avoids the necessity of searching for the bar or chain of the ordinary type of lampholder in the dark. In order to extinguish the "Rockit" lamp it is necessary to depress a small lever on the holder, but as the lamp is then burning, there is no difficulty in finding it.

The quick-acting mechanism is operated by means of a permanent magnet, and tests extending over some months have shown it to be perfectly reliable.

A Photo Lamp Unit.

This device consists of a small wire-wound resistance fitted with an adaptor and lampholder at the two ends. If it is connected to a supply at ordinary commercial voltage, i.e., 200-250 volts, and a 100-volt 100-watt general service lamp is inserted in the holder, the filament is overrun by about 7 per cent. excess voltage. The lumen output of the lamp is thereby increased about fivefold, enabling the lamp

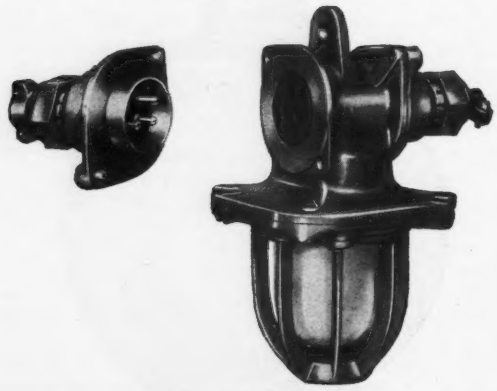


The "Rockit" Lampholder.

to be used for indoor photography. Under these conditions, a continuous life of not less than two hours is obtained, which is equivalent to about 200 "still" pictures, or 3,000 ft. of amateur cinema film. The device will be made in two voltage ranges, 200-220 and 230-250.

A Flameproof Lamp for Mine Lighting.

Amongst several new types of equipment shown by Mr. S. Anderson (General Electric Co., Ltd.) was a form of flameproof lamp to facilitate lighting at the coal face. The body is of cast aluminium and there is no internal wiring, all such connections being made by copper rods in moulded insulating material. In the event of the wellglass being removed or broken the circuit of the 40-watt lamp carried is at once



broken in a flameproof chamber. The fitting is furnished with special flameproof plugs, and up to 30 amps. can be connected in parallel on one circuit. Special cable with a double concentric screening surrounding the main conductors has been made for use with these lamps, and there are other special safety precautions.

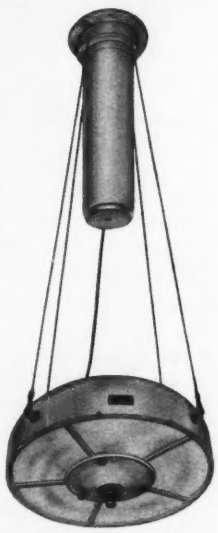
The fitting and the associated equipment have been tested and approved by the Mines Department at Buxton and carry their certificate.

Mr. Anderson also showed a simplified form of floodlight for use with Osira electric-discharge lamps enabling high-pressure mercury vapour lamps to be burned horizontally. For this purpose a magnetic deflector is mounted in a swinging cradle (so as to take up the correct position irrespective of the angle of tilt of the floodlight). A parabolic mirror trough and flat-end mirrors secure a wide fan-shaped distribution of light with small divergence in the plane at right-angles to the lamp axis. Green, blue, and yellow colour screens may be added.

A new gallery for use with enclosed units was also shown. Attention was drawn to several advantages of the method of attaching the bowl to the canopy, i.e., (1) both hands are free to perform each operation (a consideration of importance in handling large units), (2) the method of attachment is positive and prevents any possibility of working loose, (3) the arrangement is dust-proof, and (4) projecting arms are eliminated.

A New Design of Hospital Operating Theatre Fitting.

This fitting has been designed to furnish the high standard of illumination demanded by modern surgery, and utilises a special optical system, which enables approximately 90 per cent. of the flux of light from the lamp to be distributed usefully over the working area. This is effected by only single or double reflection from an accurately bent silvered-glass contour, supplemented by a further single reflection from the usual hemispherical auxiliary reflector which redirects flux normally below the horizontal filament line. The resultant beam is in the form of two independent hollow cones. The outer one ensures maximum possible shadowlessness. The inner component, owing to its wide aperture, contributes highly diffused light, which serves to produce good cavity illumination. The unit is adapted to an ordinary 150-watt clear, general-service lamp, with which about 650 foot-candles is attained over an area 12 in. in diameter on a horizontal plane 3 ft. below the unit. The maximum intensity within this region is about 850 foot-candles, and the diversity ratio less than 2 : 1. The resultant light-patch is not sharply defined, owing to the inclusion of a diffusing front glass and part-diffusing mirrors. Hence, a certain amount of diffused light is directed well outside the operating area—a recognised advantage in fittings of this type.



A New Operating Theatre Unit.

A Model Theatre.

Models of a form of theatre with curved proscenium and forestage, designed by Mr. Rivington Holmes, M.Sc., and recently displayed at the Modern Scenic Design Exhibitions in London and Manchester, were on view. The peculiar advantages of the design for stage purposes were discussed in " Drama," for June, 1936, but the points in regard to the lighting may be chiefly summarised as follows.

The use of a forestage necessitates bringing the first batten out into the auditorium, and in this design more than one row of units has been accommodated in the auditorium ceiling. Lanterns have been housed also in the front of the circle, as is now becoming customary, and the additional groups at either end of the circle to a certain extent take the place of the perches usually situated in the proscenium wings. The remainder of the equipment could be on normal lines—a set of floats, battens, and cyclorama lighting, with portable floods and spots as required.

Paraffin Vapour Handlamps and Projectors.

An interesting exhibit arranged by Mr. W. F. Turner (The Tilley Lamp Company) illustrated types of paraffin vapour lamps, similar to those mentioned in Mr. Cunnington's paper in 1934. Since that date there have been further developments, ranging from

Tilley 20,000 c.p. Paraffin Vapour Projector.

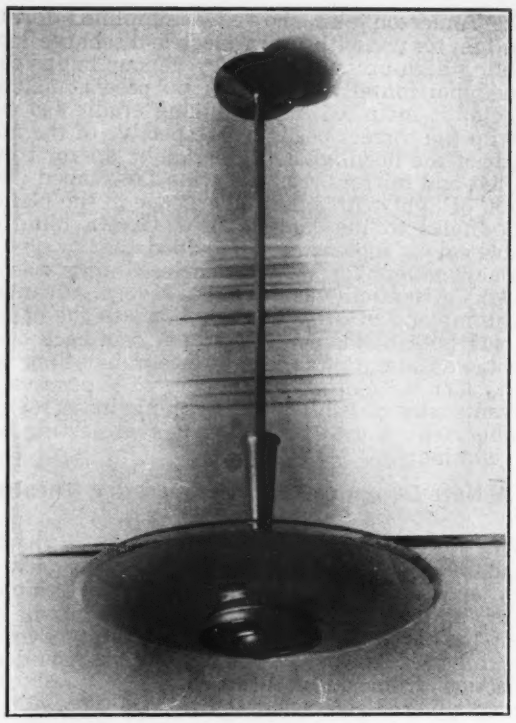
a miniature handlamp furnishing 100 candles, but weighing under 3 lb., to powerful projectors capable of furnishing 20,000 candles, such as that illustrated above. The 5,000-c.p. floodlight projector, on account of its robust construction and high efficiency, has proved very acceptable to railways, contractors, etc. The projector is glazed with armour glass, which enables the lamp to withstand severe blows, and the mantle used is one of exceptional strength — as is shown by the fact that in South American projectors using them are mounted direct and unsprung on locomotive fireboxes and used as loco-headlights. This projector only uses about one pint of paraffin during 8 hours, furnishing 5,000 c.p. during this period at a cost of one-sixth of a penny or less.

This picture illustrates the Automatic Emergency Gas Switch demonstrated by Mr. A. R. McGibbon (Messrs. William Sugg and Co. Ltd.), and described in our November, 1936, issue (p. 354).

The R.I.B.A. Indirect Fitting.

This interesting fitting, shown by Mr. C. Harvey, was designed for use in the new building of the Royal Institute of British Architects, but has since proved popular for other buildings. The nature of the fitting will be understood from the adjacent illustration. The mirrored lamp is so placed, in relation to the reflector on the underside of the glass dish, as to permit a beam of light below the horizontal line to be picked up by this reflector and directed immediately under the fitting. Photometric readings have shown that the intensity of light immediately under the fitting is about 100 per cent. greater than with the ordinary indirect type. The lamp can be removed without disturbing any other parts. The glass dishes are made in various sizes from 14½ in. up to 40 in., and for use with various lamps of consumption up to 500 watts. In new buildings where it is possible to incorporate a secondary reflector a plaster curved recess can be supplied, the curve of this being geometrically determined in relation to the height and the area to be illuminated.

A feature is the ingenious location of the filament in relation to the glass and reflector in such a way that there is practically no shadow line, and complete absence of glare. The metal work is ordinarily of aluminium but can be specially designed to harmonise with period decorations, whilst the glass may be either cut, etched, or amber or peach-tinted plate glass.



The R.I.B.A. Indirect Fitting.

A Cinema Studio Lighting Unit.

A form of 2 kW lens type cinema studio projector was shown by Mr. J. New (General Electric Co. Ltd.). This is intended to furnish a powerful spot two-three feet in diameter at a distance of ten feet, as well as serving as a floodlight at greater distances. As a spotlight it gives the necessary modelling effect to relieve monotony whilst as a "full" floodlight it provides general illumination for the entire set. It has thus distinct advantages over the conventional pattern (using a parabolic mirror) with which the floodlight effect is obtained by moving the lamp out of focus—a device which is liable to result in a dark centre with a bright edge, such as requires diffusing mediums for its correction, with consequent loss of efficiency. The advantages of this new unit were demonstrated at the meeting when attention was also drawn to the mechanical features such as the special cradle which enables the light to be thrown downwards from overhead without part of it being cut off by the foot of the fitting or staging on which it stands.

Other exhibits by the General Electric Company Ltd. included some Decorative Di-Fractor Lanterns and a new lantern for Tungsten Lamps shown by Mr. J. G. Christopher.

Truvex Condenser Lenses.

Mr. J. G. Holmes (Chance Bros. and Co., Ltd.) demonstrated the new Truvex lenses which have been designed to replace "bull's-eye" lenses for any purpose where an accurate and uniform beam of high candle-power is required and efficiency is a consideration. These lenses were originally intended for daylight and electric signalling on the railways, where they were found to double the candle-power attainable under similar conditions with spherical lenses.

Lenses of the Truvex type were next made of heat-resisting glass and applied to cinema projectors where a 5 in. lens may be situated at a distance of 4 in. from a 10 kW arc lamp. In these circumstances an increase of 25 per cent. in the screen brightness was attained. The latest development has been the application of this method to the Pathescope projector. Mr. Holmes showed two projectors of this type in operation, one fitted with a spherical lens condenser and the other with a Truvex lens condenser. It was shown that although the amount of light collected from the lamps was the same in each case the Truvex lens gave the brighter screen-image. The increase in brightness thus attainable, when the light is accurately focused on the film, may amount to 40 per cent., but, because the focusing has to be so much more accurate, an increase beyond 30 per cent. is not usually obtained.

Standard Representation Photographs of Street Lighting Installations.

This exhibit comprised a selection of photographs of different lighting installations. The photographs were produced by the technique described by Mr. R. G. Hopkinson (Transactions I.E.S., London, Vol. 1, No. 2, p. 19), which was developed from experimental work and from a consideration of the physiological characteristics of the eye. The correct density and contrast to which to print a photograph of a street lighting installation, so as to give a qualitative record of engineering value, have been correlated to the values of brightness existing in the installation.

ERRATA

We regret that by an oversight both the exhibits from the National Physical Laboratory described in our last issue (p. 374) were attributed to Mr. F. J. C. Brookes. Actually, the Daylight Meter was shown by Mr. G. P. Barnard, who was responsible for the development of this instrument.

Holophane Ltd.: Addition to Board

We learn with interest that Mr. Guy Campbell has joined the Board of Directors of Holophane, Ltd.

MAZDA MERCRA LIGHTING IS MAKING THESE ROADS SAFER

THE recent important contracts referred to below, together with many earlier ones, and others not yet begun, indicate that where accident-proof lighting and economical operation are the chief considerations, BTH equipment is chosen.

THE BTH DILEN LANTERN

is manufactured in two sizes, one, a large size as used for West Ham and Wembley suitable for 250 or 400 watt Mazda Mercra Lamps, and, two, a smaller size for use with 150 watt Mazda Mercra Lamps.

WEST HAM
700 BTH DILEN LANTERNS

700 BTH Dilen Lanterns and 700 Mazda Mercra Lamps, together with auxiliary equipment, are being supplied for improved street lighting at West Ham. The units will be erected on existing trolley-bus standards.

WEMBLEY
300 BTH DILEN LANTERNS

A further order for 173 complete units comprising Mazda Mercra Lamps, BTH Dilen Lanterns, auxiliary gear and standards, is now being executed in conjunction with The North Metropolitan Electric Supply Company for the improved lighting of the following thoroughfares :—

Fryent Road — Bridgewater Road
Park Lane — Salmon Street
Harrow Road (continuation)

This order, with the 127 lanterns already installed on the Harrow Road, makes a total of 300 BTH Dilen Lanterns supplied to Wembley.

BTH LIGHTING ENGINEERS will be pleased to collaborate with any Public Authority in the preparation of a scheme for the improvement of highway illumination. This advisory service is given without charge or obligation.

THE BRITISH THOMSON-HOUSTON CO. LTD., CROWN HOUSE, ALDWYCH, LONDON, W.C.2

M3687

Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

I.—RADIATION AND GENERAL PHYSICS.

1. The Radiological Exhibition.

C. Morgan Davies. El. Rev., Vol. CXIX., No. 3081, p. 813, December 11, 1936.

A description, with illustrations, of new radiological apparatus. R. G. H.

II.—PHOTOMETRY.

2. Photoelectric Photometer.

L. E. Howlett. Canad. J. Research, 14, 38-42, 1936.

A description is given of a photoelectric photometer for measuring general light transmission through glasses, solutions, etc. It is suitable for grading where light transmission is the control. It has been successfully used to measure precisely, quickly, and conveniently such quantities as the amounts of dyes removed from solutions by porous bodies, and the concentrations and purities of substances in solution. (*Photog. Abs.*)

F. J. C. B.

3. Photometry of Gaseous-Discharge Tubes.

Anon. R.G.E., No. 22, Vol. 40, p. 692, November 28, 1936.

Describes briefly a photometric method using a thermopile, which is claimed to have proved satisfactory.

W. R. S.

4. A Contouring Density Comparator.

J. M. Waldram. J. Sci. Inst., 352, November, 1936.

A comparator is described for use in connection with the photographic photometry of brightness distributions, permitting the drawing of equal brightness contours from a suitable negative. A beam of light of variable size is passed through the plate on to the cathode of a photocell, which is connected by a valve bridge circuit to a galvanometer. A pointer is then moved over the surface of the plate under examination in such a way as to trace out lines along which the galvanometer remains balanced. S. E.

5. The Measurement of Non-uniform Brightness by Photographic Photometry.

A. Bloch. J. Sci. Inst., 358, November, 1936.

Some precautions that have to be observed in the use of the comparator mentioned in the previous abstract are discussed. It is shown that the mean value for brightness determined by this photographic method may differ by more than 100 per cent. from the actual arithmetical mean value. To obtain the most reliable results the camera should be defocussed when taking the photograph so as to "mix" the unequal brightnesses and a transparent positive—as distinct from a negative—should be used for exploring by the photocell. S. E.

6. Correction of Errors in Photographic Photometry, Due to Irregular Density of the Plate.

J. Lagrula. Compt. rend., 202, 389-392, 1936.

The measurement of stellar magnitudes is complicated by non-uniformity of plates. Two methods are advanced for investigating a correlation between T (image density) and t (surrounding density) of plates. By some systematic experiments it can be determined how the observed variations depend on illumination and development; around several points on the plate a series of gradual densities may be formed to take account of variations affecting only the threshold or all densities and from point to point. G. Eberhard has shown this method to be too complicated. The other method involves the use of a mathematical relationship, connecting image density and surrounding density, which is given. (*Photog. Abs.*) F. J. C. B.

7. A Photoelectric Spectrophotometer of High Accuracy.

J. S. Preston and F. W. Cuckow. Proc. Phys. Soc., 869, November, 1936.

Details are given of the construction and operation of a photoelectric spectrophotometer employing a modern type of vacuum emission cell, which has a linear response over the range of currents met with in such an apparatus. The optical and electrical systems are described in detail, and some tests on different colour filters are given to indicate the order of accuracy obtained. S. E.

8. The Elimination of Errors Due to Stray Light in Spectrophotometry.

J. S. Preston. J. Sci. Inst., 368, November, 1936.

A method is described of eliminating errors that arise in spectrophotometry due to the presence of stray light in the exit slit of the monochromator. The method, involving the separation and measurement of one-half of the stray light, is particularly adapted for use with photoelectric measurements. S. E.

9. Photometric Investigation and Measurements of Spectral Intensity Distribution of Fluorescent Screens, Especially on Irradiation with Electron Rays.

M. von Ardenne. Z. Tech. Phys., 16, 61-67, 1935; Chem. Zentr., i., 3884, 1935.

The intensity and spectral distribution of light from a variety of fluorescent materials when excited by 4,000 volt-electrons, X-rays, and ultra-violet light are recorded. (*Photog. Abs.*) F. J. C. B.

III.—SOURCES OF LIGHT.

10. Progress in the Production and Application of Light.

Anon. Elect. Engineering, 55, pp. 1111-1120, October, 1936.

This article is a review of progress in illumination during the past four years, and deals mainly with new types and forms of light sources and improvements in old ones. New applications and general developments are also considered. S. S. B.

11. High Efficiency Gaseous Conduction Lamps.

L. J. Buttolph. Elect. Engineering, 55, pp. 1174-1180, November, 1936.

High efficiency gaseous conduction lamps, as exemplified by the recently developed sodium, fluorescent, and high pressure mercury vapour lamps, are discussed in this paper. The relationship between the light-energy radiated at different wave-lengths and the efficiency of the lamps is treated in some detail. S. S. B.

12. High-Intensity Mercury Arc Lamps.

J. W. Marden, N. C. Beese, and G. Meister. Elect. Engineering, 55, pp. 1186-1190, November, 1936.

The general relationship between wattage and light output of high intensity mercury arc lamps, some effects of voltage and pressure on their efficiency, and a tabulation of the actual amount of energy produced in various portions of the spectrum are discussed in this paper. The practical application of these lamps is discussed, particularly in the fields of industrial lighting and where very high intensities of light are needed, as in searchlights, locomotive headlights, and under certain conditions for projection work. S. S. B.

IV.—LIGHTING EQUIPMENT.

13. Coronation Devices.

Anon. El. Times, 90, p. 661, November 12, 1936; El. Times, 90, p. 697, November 19, 1936.

Gives photographs and a description of lighting devices appropriate to the coming Coronation. W. R. S.

14. Coronation Illumination.

Anon. El. Rev., Vol. CXIX., No. 3077, p. 670, November 13, 1936.

An illustrated article describing novel decorative fittings for Coronation display. R. G. H.

VI.—APPLICATIONS OF LIGHT.

15. To-day's Trend in Lighting.
A. L. Powell. Elect. Engineering, 55, pp. 1100-1110, October, 1936.

The author describes in some detail various installations typifying modern methods of lighting, and discusses the trend of modern ideas. S. S. B.

16. Lighting the World's Longest Bridge.
William P. Bear. El. World, 106, p. 3622, November 21, 1936.

Details are given, with photographs, of the lighting of the new bridge connecting San Francisco and Oakland. This bridge, 9½ miles in length, is lighted almost entirely by sodium vapour lamps, the main features being centralised control, sectionalised distribution, and high-intensity illumination. S. S. B.

17. Lighting Technique.
A. Salomon. Elect. 117, p. 624, November 20, 1936.

A discussion is given on the design of artificial light windows. Marked variation exists between various authorities for background brightness of the window. A formula is given from which the necessary load can be deduced from geometrical considerations. C. A. M.

18. Industrial Lighting.
Anon. Elect. 117, p. 745, December 11, 1936.

Details are given with a photograph of the lighting equipment of a new printing works. Extensive use is made of 150-watt high-pressure mercury vapour discharge lamps. C. A. M.

19. Lighting at Grimsby Fish Docks.
Anon. World Power, 26, pp. 147-149, November, 1936.

The particular lighting problems of the Fish Docks at Grimsby and their solution are described in detail. C. A. M.

20. Floodlighted Oast-Houses.
Anon. El. Times, 90, p. 730, November 26, 1936.

A photograph showing a set of illuminated oast-houses which presents a very attractive appearance, with a short description. W. R. S.

21. Floodlighting of a Corner House.
Anon. El. Times, 90, p. 700, November 19, 1936.

Lyons Strand Corner House is now floodlit with sodium discharge lamps. A photograph and short description of the installation is given. W. R. S.

22. Café Lighting.
Anon. Elect., 117, p. 623, November 20, 1936.

Unique features in the lighting equipment of two cafés recently completed are described with photographs. C. A. M.

23. Electrical Features of the Texas Centennial Central Exposition.
John Fies. Elect. Engineering, 55, pp. 1060-1074, October, 1936.

The lighting features of this exhibition are described in considerable detail. Most of the buildings had no windows, and the artificial lighting most suitable for each type of exhibit was used. The buildings were designed to be suitable for external floodlighting. Many unusual units are used for the lighting of the streets and grounds. S. S. B.

24. The Motion-Picture Screen as a Lighting Problem.
M. Luckiesh and F. K. Moss. J. Soc. Mot. Pict. Eng., 26, 578-591, 1936.

The lighting of the motion-picture screen and its environs are dealt with from the same point of view as any other lighting problem, taking into account the specialised requirements. The problem is divided into two parts, the attainment of the maximum visibility within the central field, and the illumination of the surroundings in such a manner as to produce maximum comfort and minimum loss of visibility. (*Photog. Abs.*) F. J. C. B.

25. An Analysis of Theatre and Screen Illumination Data.
S. K. Wolf. J. Soc. Mot. Pict. Eng., 26, 532-542, 1936.

The data that have accumulated over the last twenty years are discussed, and it is suggested that judging from this, a screen brightness of 8-12 foot-candles is most desirable. The variation of optimum screen brightness with screen size is dealt with, and a recommendation made. The desirable brightness of the screen periphery is discussed. It is concluded that improvements in existing projection conditions could be made by following more closely existing information, but that further investigations are desirable. (*Photog. Abs.*) F. J. C. B.

26. Résumé of Methods of Determining Screen Brightness and Reflectance.
W. F. Little and A. T. Williams. J. Soc. Mot. Pict. Eng., 26, 570-577, 1936.

Various simple and common methods of measuring the brightness and reflectance of screens are described. A new photoelectric illumination meter is mentioned by which both factors can be evaluated. (*Photog. Abs.*) F. J. C. B.

27. An Experimental Investigation of Projection Screen Brightness.—I. Choice of Average Observer.
B. O'Brien and C. M. Tuttle. J. Soc. Mot. Pict. Eng., 26, 505-517, 1936.

A 16 mm. projector, capable of delivering much more light on a translucent screen than is likely to be tolerated, is used, and a remote control operating a neutral wedge over the projection lens is fitted. The periphery of the screen is illuminated from behind by controlled lamps. The film used contained various kinds of subjects. The selections of thirteen observers are given, and it is concluded that (1) the average selected brightness is about 30 foot-lamberts; (2) individual observers differ by a factor of 3; (3) a border brightness of 0.05 foot-lamberts is preferable to a dark border. (*Photog. Abs.*) F. J. C. B.

28. Screen Brightness and the Visual Functions.
E. M. Lowry. J. Soc. Mot. Pict. Eng., 26, 490-504, 1936.

The most important factors in the visibility of objects are enumerated and discussed in relation to the visibility of detail on the motion-picture screen. The most important factor is the perception of detail, and this is found to depend on the threshold sensitivity of the eye, the ability to distinguish small differences in intensity, the smallest angular dimensions of an object necessary to be distinguished and the speed of vision. These factors are discussed together with the effect upon them of external factors with which they are correlated. (*Photog. Abs.*) F. J. C. B.

27th Annual Exhibition of Scientific Instruments and Apparatus

As we go to press we receive the catalogue of the above exhibition, arranged to be held at the Imperial College of Science and Technology, South Kensington, during January 5-7, 1937.

As usual, the record of the Research and Educational Section contains some interesting items. The National Physical Laboratory has a comprehensive exhibit. The British Thomson-Houston Co., Ltd., include demonstrations of experiments on phosphorescent light (by means of a rotating cylinder coated with sensitive material and subject to exciting radiation), stroboscopic effects, and the production of flashes of very short duration, and the exhibition of fluorescence by numerous recently developed powders.

A very interesting exhibit by the Post Office Engineering Research Station illustrates the use of photoelectric equipment for examining stamps on letters, and especially discriminating between stamps of different colours—an arrangement which facilitates automatic sorting of mail.

The General Electric Co., Ltd., show a new transportable, universal, photoelectric photometer, specially useful where very small amounts of luminous flux are involved, and a photoelectric colour-matching apparatus. There is also an apparatus for use with a photoelectric colorimeter, based on the use of three galvanometers, connected respectively to cells receiving light via red, green, and blue filters. This should be specially interesting to members of the I.E.S. who attended Mr. Guild's recent lecture on colorimetry.

Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

No. 454,131. "Improvements in and Relating to Lamp Reflectors."

Dietrich, F. R. March 4, 1935. (*Convention, Germany.*)

According to this specification, a lamp reflector for a headlamp or the like comprises a paraboloidal part joined to the rim of an ellipsoidal part, and the ellipsoidal part has its foci far apart, one coinciding with the focus of the paraboloidal part and the other outside the front of the reflector. The lamp may be provided with a dispersive lens, occupying the central part only of the aperture to receive the convergent beam from the ellipsoidal part of the reflector and to render this beam parallel.

No. 454,146. "Improvements in Photoelectric Cells."

N. V. Philips Gloeilampen Fabrieken. August 2, 1935. (*Convention, Holland.*)

In photoelectric cells with a cathode having an alkali metal adsorbed to a salt layer and a low-pressure gas filling a rapid fall of sensitivity often takes place. In order to avoid this, according to this specification, the anode of the cell is filamentary or rod shaped, and the distance from the anode to the nearest part of the cathode is, at the most, one-fifth of the distance from the anode to the middle of the cathode portion opposite the window of the cell. Thus the ionic bombardment of the cathode mainly takes place in the region near the anode and the region opposite the window of the cell is largely freed from ionic bombardment.

No 454,194. "Improvements in or Relating to Illuminating Means for Landing Grounds."

Naamlooze Vennootschap Machinerieenen Apparaten Fabrieken "Meaf." December 3, 1934. (*Convention, Germany.*)

This specification covers a lamp or beacon for illuminating landing grounds, including a lens system of large angle of light reception and of short focal length, and a lens system of limited angle of light reception and long focal length, in which the housing or casing comprises two or more parts movable telescopically one within another. The lowermost part carries the light source and the lens system of short focal length, while the lens of long focal length is carried in the topmost part. A switching arrangement is provided by which the light source is disconnected, except when the casing parts are in their fully extended position.

No. 454,348. "Improved Device comprising an Electric Mercury-Vapour Discharge Tube and a Red-Fluorescent Layer."

N. V. Philips Gloeilampen Fabrieken. March 20, 1935. (*Convention, Germany.*)

In lamps using red fluorescent rhodamine excited by a discharge tube, it has been found that the rhodamine tends to lose its fluorescent properties. According to this specification, in order to avoid loss of fluorescent properties of the red fluorescent rhodamine, it is excited by a mercury-vapour discharge tube operating at a pressure which is higher than ten atmospheres and preferably higher than twenty atmospheres. It is stated that the radiation of a mercury-vapour lamp operated at these high pressures at a wave length about 2537 A is comparatively feeble and does not spoil the fluorescent properties of the rhodamine material.

No. 454,906. "Improvements in or Relating to Illuminating Devices comprising Liquid Cooled Sources of Electric Illumination."

N. V. Philips Gloeilampen Fabrieken. March 20, 1935. (*Convention, Germany.*)

According to this specification, a lamp employing liquid cooled light sources comprises a fixed head with liquid ducts and electric current leads and one or more casings movable, preferably rotatably, on the head for the support of one or more liquid cooled lamps, such as high-pressure discharge tubes having a contracted discharge path, the liquid and current supply system in the head co-operating with similar systems in the casings, so that only when in the operative position can a lamp be connected to the liquid and current supplies. Thus, if a lamp goes out of action it may be replaced without delay by another lamp in another casing.

No. 455,459. "Electric Candle Lamp."

Vereinigte Glühlampen Und Electricitäts Aktiengesellschaft. October 23, 1934. (*Convention, Austria.*)

According to this specification, an electric candle lamp, the walls of which do not became excessively hot and blackened, has a bulb of opal glass of the dimensions and form of a candle flame and filled with krypton, with or without small admixtures of other gases, at a pressure of more than 200 mm. of mercury.

No. 455,476. "Improvements in and Relating to Illuminating Apparatus."

Julius Pintsch Aktiengesellschaft. March 18, 1935. (*Convention, Germany.*)

A lamp for illumination of objects of great length, such as barriers of railway crossings, is described in this specification. The light emerging from the light source of the lamp is directed by a cut-away parabolic reflector, a spherical reflector, and a lens. The reflectors and lens are arranged with divergent axes about the light source so that they produce beams of graduated intensity in different directions.

No. 455,683. "Improvements in Luminous Electric Discharge Tubes."

Société Anonyme pour les Applications de L'Electricité et des Gaz Rares, Etablissements Claude-Paz and Silva. December 7, 1935. (*Convention, France.*)

According to this specification, luminous discharge tubes coated internally with fluorescent material have a filling of pure xenon, pure krypton, or a mixture of these and without mercury vapour. It is stated that the discharge through these two gases is more effective than that through mercury vapour for exciting fluorescent materials, and the luminous intensity and colour does not change at low temperatures. The diameter of the tube is preferably 40 to 80 mm., the pressure 1 to 10 mm., and the current 50 to 100 m.a.

ONLY VITREOSIL LIGHTING WARE GIVES THIS MARGIN OF SAFETY

Note the Vitreosil Test. Only Vitreosil Lighting Ware survives this ordeal. Any other lighting glassware, even though it passes the British Standard Specification Test, would be shattered by the shock of sudden cooling from red heat. This means a margin of safety far in excess of the needs of domestic or industrial lighting. It enables Vitreosil Globes, Bowls and Reflectors to be used on high-pressure and super-heated burners without the slightest fear of "flying."

Moreover, smaller shapes can be confidently used, thus concentrating the mantle heat and producing a brighter light which is softly diffused with the minimum loss by passage through Vitreosil.

There is unique beauty in the pearly lustre and satin-like surface of Vitreosil, and the patterns are designed for modern decorative needs.

VITREOSIL

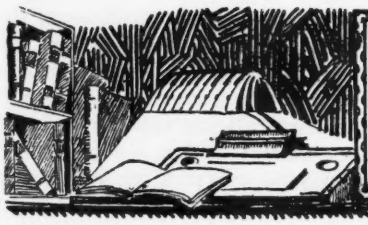
Lists on request from the Sole Manufacturers—

THE THERMAL SYNDICATE LIMITED

Vitreosil Works, Wallsend-on-Tyne.

London Depot: Thermal House, Old Pye St., S.W.1

GLOBES · BOWLS · REFLECTORS · · OF PURE FUSED SILICA



REVIEWS OF BOOKS AND PUBLICATIONS RECEIVED

The Scientific Basis of Illuminating Engineering. By Parry Moon. (McGraw-Hill Book Company, New York and London, 1936; pp. 608. Price 30s.)

This book is the outcome of a series of lectures delivered at the Massachusetts Institute of Technology. As the title suggests, the author does not attempt the consideration of lighting as an art. He is concerned rather with the engineering basis of illumination, and throughout the book stress is laid on quantitative aspects. The volume occupies over 600 pages. There are, in all, fourteen chapters, apart from preface, appendices, and index. There is, therefore, ample material for study—and especially for those to whom mathematical treatment appeals. The initial chapter deals with fundamentals. Study of the spectrum and the spectroradiometric curve and luminous flux follow, after which we have two chapters dealing with radiation from gaseous and incandescent bodies. The principles underlying electric discharge lamps are here outlined; it is, perhaps, too much to expect a chapter dealing with the practical features of such lamps, similar to that devoted to incandescent lamps, in view of the recent introduction of the former. "The Measurement of Light" (Chapter VII.) is followed by sections dealing with illumination from point and surface sources, calculations, and lighting design. Final chapters dealing with Vision, Colour, and Design for Seeing.

The treatment of the author is somewhat unusual. In the early chapters he regards the distribution of light in the spectrum as the starting point, whilst in the second of a series of appendices (occupying together approximately seventy pages) he challenges the familiar definitions based on a visual comparison against a candle-power standard, and tentatively suggests a policy of scrapping them and adopting a standard based on physical measurements. In the introduction the author confesses that some of his statments have a "decidedly dogmatic ring." This one can forgive in consideration of a fresh view, and there can be no doubt that the author has broken new ground and produced a textbook which deviates considerably from the usual course.

It is characteristic that in the chapter on measurements he quickly becomes immersed in spectrophotometry, discusses photoelectric cells in great detail, but dismisses visual photometers (including all illumination photometers of this type)

687793

in a few lines. We cannot help feeling that a student might have preferred a little information on these familiar processes to, for example, the tables dealing with Planckian Radiation which occupy nearly twenty pages in the appendices.

Perhaps the chapters that best repay study are those covering calculations and design. It is useful to have the formulae covering the effect of surfaces of different types (areas, bands, discs, spheres, etc.), and the fully illustrated treatment of built-in lighting. Much of the data in these and other chapters is of an original nature. The Section on Vision is also interesting and is completed by an exceptionally full series of references.

The printing and get-up of the book are excellent. There are many references, lists of symbols and abbreviations, and an index. The plan of giving, at the beginning of the book, a full list of abbreviations used in references may be commended. One is, however, a little surprised to note that although many somewhat abstruse scientific journals are here quoted, the author does not seem to have occasion to mention publications in this country exclusively devoted to lighting and photometry—such as those of the Illuminating Engineering Society (London).

Electric Illumination Exhibition

On December 15 the Electric Illumination Exhibition at the Science Museum (South Kensington) was opened by Lord Rutherford, who summarised the steps leading to the present state of electric lighting, from the discoveries of Sir Humphrey Davy onwards. He pointed out, very truly, what an exceptionally good example is here presented of the close relationship between science and industry. The chair was taken by Sir Henry Lyons, chairman of the Science Museum Council, and Mr. H. T. Young, president of the I.E.E., moved a vote of thanks to Lord Rutherford for his address. The exhibition has been arranged by the Electric Lamp Manufacturers Association and the authorities at the Museum, and much care having been devoted to the exhibits by Mr. W. T. O'Dea, the Assistant Keeper.

The exhibition is to remain open until April 25. Members of the Illuminating Engineering Society have already had opportunities of viewing the exhibits, and no doubt many readers of the journal have also seen them, or will do so very shortly. A detailed description is therefore hardly necessary, as well as less satisfactory than actual inspection. One may, however, give a brief general account and touch on certain specially interesting features.

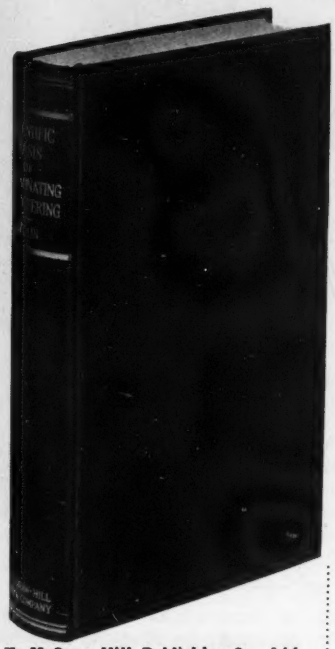
There are a few exhibits of a historical nature, showing progress from early illuminants up to lamps of the present day, but the exhibit as a whole is devised to illustrate *effects* of light. The 4,000 square feet of space devoted to the exhibition are occupied mainly by a series of booths in which fundamental principles are illustrated. In almost all cases the effect to be studied is operated and controlled by the visitor, by merely closing a switch. Amongst the lessons thus taught are, the need for strong illumination to reveal small objects, the effect of higher illuminations in apparently slowing down motion, the comparative effect of a new lamp in a perfectly clean opal bowl and an old one in equipment on which the dust of months has accumulated, and the effect of colour of surroundings in modifying the resultant illumination. The latter device is particularly well conceived. The visitor can himself alter the surroundings and observe the effect on a small light-metre within the model room. Elsewhere the effects

A view of the model of St. Paul's at the Electric Illumination Exhibition, showing some of several alternative methods of floodlighting.

of electric discharge lamps on colours, and especially the improvement in the red element secured by the aid of fluorescent tubes are shown. There is also a display showing some of the remarkable stroboscopic effects attainable with discharge lamps. The familiar E.L.M.A. light-tester, by means of which visitors may explore for themselves how much light they need for reading, is in operation. Various models illustrate good and bad methods of lighting and its artistic possibilities. Amongst these are demonstrations of the lighting of a modern aerodrome, and of alternative methods of floodlighting such buildings as Bush House and St. Paul's. The latter (illustrated above) is a particularly effective exhibit. Architectural lighting receives attention in a special section where various forms of equipment may be operated by means of a large desk-type switchboard. The exhibition, in short, has all the elements to interest the public, and the fact that the visitor is given such exceptional powers of control should appeal strongly to the younger generation who commonly visit the Science Museum in large numbers during the vacations.

On successive Mondays from January 11 to February 15 lectures on various topics will be given at 5.30 p.m. Admission to these is by tickets (obtainable from the Director of the Museum). The subjects announced for successive lectures are: Electric Lamps (Mr. C. C. Paterson), Light and Vision (Dr. J. W. T. Walsh), Luminescence and Fluorescence (Mr. L. J. Davies), Electric Street Lighting, Floodlighting (Mr. H. Lingard), and Light and Architecture (Mr. Howard Robertson).

As a supplement to the exhibition an illustrated handbook, entitled "Electrical Illumination," by Mr. W. T. O'Dea, has been issued, and is available from H.M. Stationery Office (6d. net). This is not a catalogue, but is intended as a summary of the basic factors influencing electric illumination. It contains three main sections dealing respectively with General Principles, Lighting Systems, and Calculations, and Illumination Design Calculations, followed by a brief historical survey.



The fundamentals of Radiation, Illumination and Vision—a wealth of reference data

THE SCIENTIFIC BASIS OF

ILLUMINATING ENGINEERING

by PARRY MOON

Assistant Professor of Electrical Engineering
Massachusetts Institute of Technology

608 pages, 9″ × 6″, illustrated, 30/- net

SPECIAL FEATURES

1. Treatment is based on the spectro-radiometric curve instead of the standard candle.
2. Shows the student the connection between illuminating engineering and the physics of radiation and explains the fundamental methods used in all photometry and radiometry.
3. Gives more than usual attention to such important topics as physical photometry, radiation from incandescent filaments, light production from gaseous-conduction lamps, research on seeing (the photochemical theory of vision adaptation, visual acuity, contrast sensitivity, glare, etc.), design of lighting systems, on the basis of seeing, etc.
4. Considers the latest developments such as the barrier-layer photo-electric cell, the sodium lamp, the high-pressure mercury lamp, built-in lighting for interiors, etc.
5. Offers a wealth of numerical data in the form of tables and graphs, many of which are here published for the first time.
6. Includes problems at the end of each section illustrating the material presented in that section. Frequent worked-out examples are also given.

CHAPTER HEADINGS

Preface
Abbreviations Used in Bibliographical References.
Fundamentals.
The Spectro-radiometric Curve.
Luminous Flux.
Radiation from Gaseous-Conduction Sources.
Radiation from Incandescent Sources.
Incandescent Lamps.
Measurement of Light.
Illumination from Point Sources.
Illumination from Surface Sources.
Short Cuts in Calculating Illumination.
Elements of Lighting Design.
Vision.
Colour.
Design for Seeing
Appendices.
Index.

ORDER TODAY

To McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2.
(You may hand this order to your bookseller.)

Please send me a copy of
ILLUMINATING ENGINEERING
by MOON

I enclose remittance £ : :

Name.....

Address .....

.....

Lighting for the Sanctuary

We are indebted to Mr. J. Mortimer Hawkins for the two accompanying illustrations, showing the lighting of the Sanctuary in St. George's Church, Brentwood, Essex. This problem in church lighting is one that is apt to excite controversy. How far is it expedient that the Sanctuary should be "dramatised in light"; and when does an effect pass beyond what is appropriate and become too sensational?

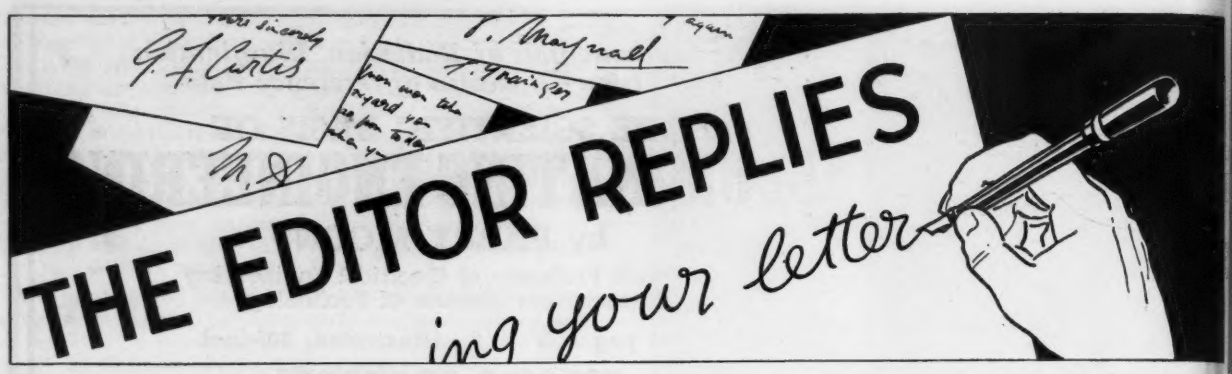
In this case four alternative methods of lighting are provided:—

(a) The normal floodlighting.
(b) Indirect lighting from special units in the hollow window sills.

(c) Floodlighting with amber-coloured light.
(d) Floodlighting from outside the Sanctuary windows, giving the effect of light streaming in from outside the church.

The conditions may, therefore, be varied widely according to circumstances. The fourth method mentioned—lighting from outside—is one which deserves to be more fully explored in churches.

The Corpatact Manufacturing Company, of Iver, Bucks, wish to advise all agents and clients who are interested in Corpatact devices that these can now be obtained direct from the manufacturer and patentee, who is the owner of the registered trade mark, "Corpatact." All inquiries will have immediate attention.



We not infrequently receive inquiries over the telephone which cannot, with the best will in the world, be settled on the spot—recent requests relating to the planning of a gas-lighted schoolroom in order to furnish ten foot-candles, and for information on the best means of presenting evidence to someone abroad that the natural lighting of an office *here* is inadequate, are cases on point.

Such inquiries ought really to furnish work for **consultants on lighting,** and it would be a convenience if members of the Society, who are free to do consulting work, would send us a reminder, mentioning the specific kinds of work they can undertake. In some cases we have already passed on such inquiries. But our list of consultants is not a very lengthy one!

In one particular case that is occasionally put to us—finding someone with both the knowledge and the impartial position to give a judgment on the comparative merits of **street lighting**—the difficulty in finding a suitable consultant is considerable. But there are no doubt members who, whilst associated with firms handling some aspect of lighting, are, nevertheless, free to give advice on many problems.

Whilst, as remarked above, there are indeed few general consultants on street lighting, the position of **the public lighting engineer** attached to a certain city or area is becoming better recognised. It is, therefore, discouraging to observe that Dundee Corporation has recently decided upon the abolition of the post of public lighting inspector. The present engineer, Mr. R. D. Robertson, is retiring, and it is now proposed to hand the lighting of the City over to the Gas and Electricity Departments.

We need not say that this strikes us as a retrograde step. In such a city as Dundee there should be ample opportunities for a qualified and independent public lighting expert. Dividing the lighting between the Gas and Electricity Departments, neither of which can take an impartial view, and both of which have many other things requiring their attention, does not strike us as at all a satisfactory arrangement.

We have been asked why **Belisha Beacons** remain unlighted. We agree that it is anomalous that they should not be lighted at night, and that many of them are, in fact, so difficult to distinguish at night time as to be of little use—at a time when their value should be, if anything, greater than in the daytime.

Difficulty in getting connections to gas and electricity supplies is sometimes urged—but one has the impression that lighting was originally abandoned owing to the initial outbreak of stone-throwing by which the beacons were greeted. Now that beacons are familiar objects of recognised utility, stone-throwing is less likely. In any case, methods of lighting moderately proof against such irregularities are not impracticable. We hear that in Manchester, Southport, and Newcastle, and doubtless in other localities, lighting is being adopted. In cities there should be no difficulty in getting supplies, and in somewhat more remote spots Calor Gas would no doubt do all that is necessary.

A reader has expressed curiosity in regard to **house organs dealing with lighting.** Two of the most widely disseminated are doubtless the **Osram Bulletin** (the General Electric Co., Ltd.) and the **Reflector** (Benjamin Electric, Ltd.), both of which are well illustrated and contain interesting reading. A smaller production is that issued by Kandem Electrical, Ltd. We should be interested to see other publications of this nature in which lighting figures prominently.

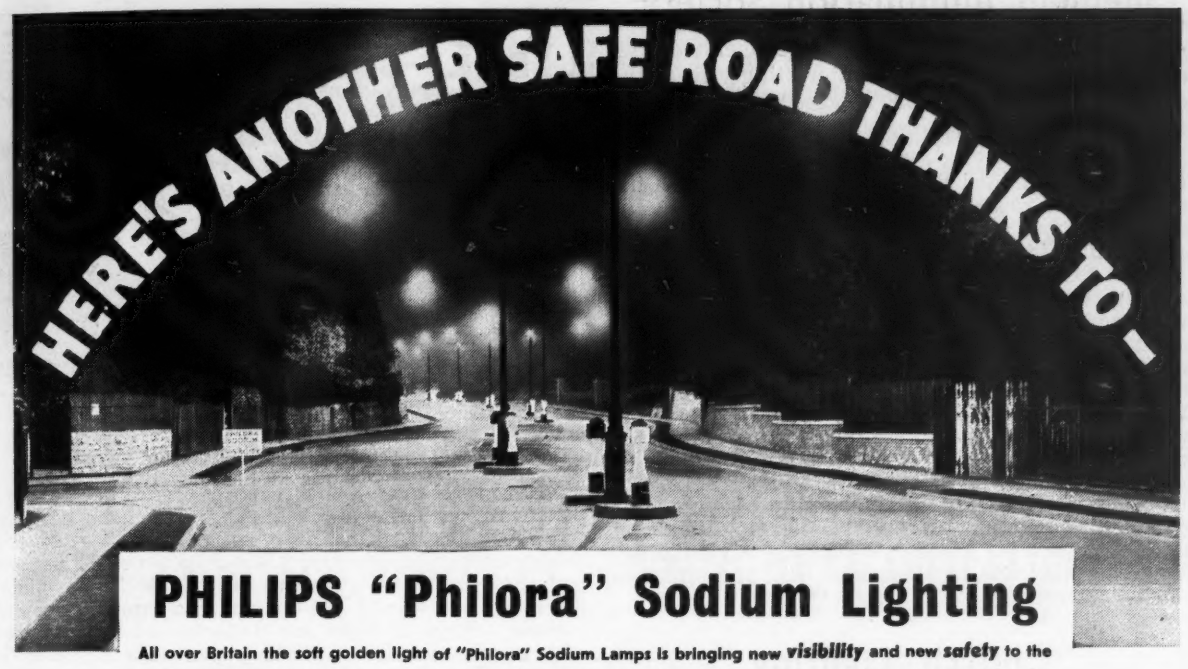
We have been asked if there exists a really compact, simple, and inexpensive apparatus for **studying fluorescence effects.** We have seen a compact outfit supplied by the Strand Electric and Engineering Co., Ltd., but we do not know of any really cheap and simple source of ultra-violet energy which would answer for analytical tests.

The familiar cabinet utilising light from a quartz mercury lamp is excellent for experts, but too costly and elaborate to come into really general use for such purposes as the examination of rare postage stamps by collectors. Bearing in mind that the area to be illuminated is but small, it should not be impossible to devise a lamp utilising an overrun filament lamp or small arc, such as could be worked off plugged into an ordinary lamp-holder. Such an outfit might have wide applications. We commend the idea to manufacturers.

Better Light—Better Sight

We recently mentioned the "Better Light—Better Sight" display, illustrating fundamentals of lighting, arranged at the Mayflower Hotel, Washington, U.S.A., during the recent World Power Conference. Mr. S. G. Hibben, chairman of the Lighting Committee, sends us some views of the exhibits, which

were brought before the notice of some thousands of visitors. The accompanying picture shows part of the exhibit-area, in which the "Light Intensity Selector" was stationed. Many people tried their luck with this apparatus, which stood in the open and was not screened in any way, and upwards of sixty foot-candles was usually selected.



PHILIPS "Philora" Sodium Lighting

All over Britain the soft golden light of "Philora" Sodium Lamps is bringing new ***visibility*** and new ***safety*** to the roads. "Philora" Lamps give as much as five times more light than ordinary lamps of similar wattage and have a guaranteed life of 2,500 hours. There is no dangerous glare or dazzle with Sodium Lighting. Because of its greater visibility, extra safety and proved economy, "Philora" Lighting is being installed all over the country.

Installations at:— Bolton, Chapel, Crewe, Gloucester, Liverpool, Rochdale, Scunthorpe, Bacup, Cardiff, Cheltenham, Croydon, Kingswinford, Nuneaton, Runcorn, Swansea, etc.

PHILIPS "PHILORA" SODIUM FOR VISIBILITY

PHILIPS LAMPS LTD., "PHILORA" LAMP DEPT., 145, CHARING CROSS ROAD, LONDON, W.C.2

Holophane Novelties

Holophane products are very rapidly developed to meet the requirements of progress or fashion, and their most recent "Development Supplement" contains quite a number of new things, two of which are illustrated here.

Besides these two units we notice the "stepped" prismatic ceiling fitting and pedestal flood exhibited at the opening meeting of the Illuminating Engineering Society, the new semi-indirect "Auralite" fittings,

These spheres are 10 inches in diameter and accommodate one 200-watt lamp. The two half spheres are joined together internally and have a smooth exterior finish.

The fitting may be either of the indirect or the semi-indirect pattern. In the former the lower member is of polished aluminium, whilst in the latter of "white" glass.

A pleasing type of wall bracket.

For Private House and Restaurant Lighting.

and a flood-projector, intended for use with horizontal-burning sodium electric discharge lamps. This is equipped with a specially designed silvered-glass trough reflector, giving a strong beam of light over a wide area.

We learn that Messrs. Frederick Thomas and Co., Ltd., have secured a contract for the manufacture of electric lighting fittings for the extensions of the Barking Power Station; these are a replica of the types previously supplied for the main station.

Sheffield Illumination Society

Sixty members and friends of the Sheffield Illumination Society paid a very interesting visit to the glass works of the British Thomson-Houston Company, Ltd., Chesterfield, on November 25 last.

The full process of glass making and blowing was shown and explained by competent guides, from the mixing of the raw materials to the moulding of the glass into tubes and bulbs. Blowing and tempering of the bulbs is done by machinery, and surprisingly few are discarded as faulty by the examiners. It is interesting to note, however, that even in these mechanical days bulb-blowing is still carried out manually to a fairly large extent. Another interesting part of the factory was that devoted to the making of glass tubing and tumblers. The lamps and tubing were seen packed for transport to the Rugby works of the company, where the filament is inserted to complete the making of electric lamps.

We notice that at the recent annual meeting of the Society, which has a membership of eighty-six, Mr. J. F. Colquhoun, the public lighting engineer of Sheffield and the founder, was re-elected Honorary President, and Mr. E. Marrison, his assistant, as honorary secretary.

Church Lighting

This picture of St. Andrew's Church, Great Ilford, which is lighted by Holophane Reflector Refractors, is interesting for the method of mounting units on

brackets from the apices of the arches. This modern building—the Bishop Jacob Memorial Church—has a red brick interior, and the brackets were specially designed to harmonise with the architectural scheme.

THE CORPATACT MANUFACTURING COMPANY beg to advise their numerous Clients that they are specialists in the manufacture of all types of Capacity Operated Switch Gear, and undertake the design and manufacture of Electrical Mechanical equipment requiring expert staff.

Specialists in Burglar Alarm equipment, manufactured under our own Patents. Enquiries invited. Capacity operated switches for Window Lighting.

Only Address :—

THE CORPATACT MANUFACTURING CO., IVER, BUCKS.

Owners of the registered Trade Mark "CORPATACT."

Lighting Belisha Beacons

Newcastle-upon-Tyne Corporation has been experimenting with the night-lighting of Belisha beacons. A special device for the purpose, erected at several busy crossings, includes a gas-feed pipe in the stem of the beacon, an automatic regulator in the globe, and a new type of gas-burner in a lamp above the globe. Rays of light are deflected on to the globe by a special reflector, which prevents diffusion of light. The Corporation is also carrying out tests of an electric device for the same purpose.

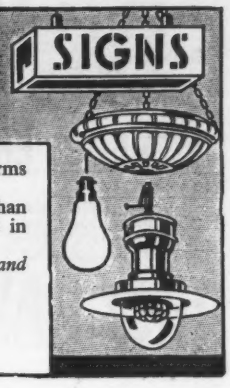
Sodium Lighting at Gloucester

The picture above illustrates the appearance of Burnwood-road, Gloucester, a section of the area recently illuminated by 50 W. "Philora" sodium lamps in Wardle "Solux" fittings. The units are spaced at an average of 120 ft. apart and are mounted 21 ft. 6 in. high, the road being 60 ft. wide. The City Engineer and Surveyor, Mr. M. C. J. Scudamore, M.I.C.E., and the City Electrical Engineer, Mr. F. H. Corson, M.I.E.E., collaborated in regard to the installation.

The Value of the Development of the Lighting Load

A very interesting discussion will take place at one of the informal meetings of the Institution of Electrical Engineers, at their London headquarters, on the evening of February 15. "The Value of the Lighting Load" is to be discussed, the opening speaker, we understand, being Mr. H. H. Long. This is a subject in which many members of the Illuminating Engineering Society will doubtless be keenly interested. We shall be glad to hear from any of those who are not members of the Institution and would like to receive a ticket.

·WHERE TO BUY·
A DIRECTORY OF LIGHTING EQUIPMENT



We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3½ inches wide) are given below.

These terms are equivalent to **half our ordinary advertising rates**, but not less than 12 successive monthly insertions can be accepted on this basis, and amounts are payable in advance.

Payment for an advertisement in this section entitles the advertiser to receive *Light and Lighting* during the period of the contract.

Terms:				
12 Successive Monthly Insertions	£3 10 0	Payable
24 ,, ,, ,,	£6 0 0	in
36 ,, ,, ,,	£8 10 0	Advance

1

MODERN LIGHTING FITTINGS

New Catalogue on application

Fittings manufactured to Architects' Specifications

ASCOG LIMITED

Ascog House, 44, Theobalds Road, LONDON, W.C.1

2

PHOTOMETRIC EQUIPMENT for technical, lighting, and scientific research

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER, S.W.1

3

ALLOM BROTHERS LTD.

16, GROSVENOR PLACE, LONDON, S.W.1.

Specialists in the Science of Modern Lighting, including:

Theatres and Public Halls. Tennis and Racquet Courts.
Pictures and Picture Galleries. Floodlighting, etc.
Decorative Fittings in Glass and Metal.

4

Take no risks— specify **BENJAMIN PLANNED LIGHTING**

THE BENJAMIN ELECTRIC, Ltd., TARIFF ROAD, N.17

5

MAZDA LAMPS and B T H LIGHTING EQUIPMENT

Our Illuminating Engineers will be pleased to advise you on any street or floodlighting problem

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2

6

BROMFORD

Seamless Steel Lighting Standards

for all requirements

BROMFORD TUBE CO., LTD., ASTON, BIRMINGHAM

7

BOOKS

PLEASE send for Detailed list of Books on Illuminating Engineering and allied subjects, post free, from:

CHAPMAN & HALL, Ltd., 11, Henrietta St., London, W.C.2

8

THE REINFORCED CONCRETE LAMP COLUMNS SPECIALISTS.

CONCRETE UTILITIES, Ltd.

WARE, Herts.

9

CRYSTAL CHANDELIERS AND SILVERED GLASS REFLECTORS

— DIRECT IMPORTERS —

PLEASE WRITE FOR CATALOGUE AND TERMS:

CRYSTAL & INDUSTRIAL FITTINGS Co., 72 Shoe Lane, Fleet Street, E.C.4. Telephone: CENTRAL 7340.

10

Curtis Lighting

COMPANY OF GREAT BRITAIN LIMITED

OFFICES: ALDWYCH HOUSE LONDON W.C.2. WORKS: PONDERS END MIDDLESEX.

Manufacturers of **X-Ray Reflectors**

11

DAWSON REFLECTORS

Indoor and Outdoor Floodlights

JENA REFLECTOR FITTINGS

Miss E. H. DAWSON & HENCKEL, 42, Gray's Inn Rd., London, W.C.1

Telephone: Chancery 7751/2

12

Specialists in

ARCHITECTURAL ILLUMINATION AND DESIGNS

DRAKE & GORHAM LTD.

36, GROSVENOR GARDENS, LONDON, S.W.1

Manchester, Glasgow, Hereford and Winchester.

13

ELECTRICITY SERVICES LTD.

Sole Proprietors and Patentees of the "ALL PURPOSES"

TYPERLITE LOCAL LIGHTING UNITS

86, Cannon St., LONDON, E.C.4

Mansion House 5294 (3 lines)

14

"ESLA"

BI-MULTI AND MULTIPLANE REFLECTORS

Lanterns, Brackets, Columns, Switches and Fuse Boxes, etc., FOR STREET LIGHTING

The Electric Street Lighting Apparatus Co.
The Foundry, Canterbury

15

ELM WORKS, LTD.
Established 1903 Summerstown, London, S.W.17
Suspension Lamps, Lanterns, **REFLECTORS**
for **PUBLIC & INDUSTRIAL LIGHTING**
GAS and ELECTRIC
VITREOUS ENAMELLING Sheet Metal Work, Metal Spinning, &c.

16

ENGINEERING & LIGHTING EQUIPMENT CO. LTD.
SPHERE WORKS,
ST. ALBANS, HERTS.
TELE. 258
DISCHARGE LIGHTING
FITTINGS FOR
ALL PURPOSES

17

PHOTOMETERS
PHOTO-ELECTRIC
BENCH, CUBE, STREET and PORTABLE TYPES
FOR CANDLE-POWER AND ILLUMINATION TESTS
EVERETT EDGCUMBE Colindale Works LONDON, N.W.9

18

FARADAY HOUSE
TESTING LABORATORIES
All kinds of Lamps, Reflectors, etc., Tested
LAMPS TESTED TO B.S.S. No. 161, 1934
SCALE OF FEES ON APPLICATION TO THE SUPERINTENDENT
66, SOUTHAMPTON ROW, W.C.1

19

FLOODLIGHTING & FITTINGS
LTD.
294, GRAY'S INN ROAD, W.C.1
Manufacturers of "FLOOD" Units
Specialists in Modern Lighting Fittings
Telephone: TERMINUS 5954

500/1000 Watts
Model "B"

20

FOSTER & PULLEN Ltd.
make all types of Lanterns for Street Lighting
BY GAS
Samples for trial willingly sent—we invite comparison on both cost and quality
AVIL WORKS **BRADFORD**

21

GOWSHALL
GOWSHALL LTD. for "Guardian Angel" Illuminated Guard Posts & M.O.T. Signs.
London Office and Works
14-15 LAMBS CONDUIT PASSAGE, RED LION SQUARE, LONDON, W.C.1
Telephone CHAncery 7042 and 7845
Head Office and Works
CHESTON ROAD, ASTON, BIRMINGHAM 7 Telephone EAST 1426

22

TM GUNFIRE (Trade Mark)
PIONEERS of AUTOMATIC LIGHTING
GAS CONTROLLERS, ELECTRIC, and SYNCHRONOUS TIME SWITCHES
Manufactured by:—
BRITISH, FOREIGN AND COLONIAL AUTOMATIC LIGHT CONTROLLING CO., LTD., BOURNEMOUTH

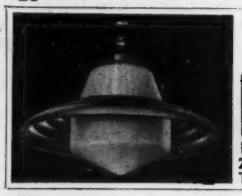
23

Aldwych House, London, W.C.
G·V·D
Telephone: Holborn, 7277-8
FOR BETTER LIGHTING

24

"HAILWARE!"
BRITISH MADE ILLUMINATING GLASSWARE AND FITTINGS. TRAFFIC GLOBES AND SIGNS, ISLAND COLUMNS AND FOOTLIGHTS,
HAILWOOD & ACKROYD, Ltd.
BEACON WORKS, MORLEY, Near LEEDS.
Branches and Showrooms:
71/75, New Oxford St., London, W.C.1. 314, St. Vincent St., Glasgow, C. 3.
31, Colmore Row, Birmingham.
Ulster Agents: Messrs. Bell & Hull, 17, College Street, Belfast.

25



Decorative, Architectural and Commercial Lighting Fittings and Equipment.
Harcourts LIMITED
21a Newman St., Oxford St., London, W.1.
Telephone: Museum 8732/3/4 H.L. 50

26

EVERY TYPE OF MODERN
LIGHTING
BY
L. G. HAWKINS & CO., LTD.,
30-35, DRURY LANE, W.C.2

27

SCIENTIFIC Holophane TRADE MARK ILLUMINATION
The Hall-Mark of Good Lighting

28

NEWBRIDGE
GAS CONTROLLERS AND ELECTRIC TIME SWITCHES.
FOR STREET LIGHTING AND INDUSTRIAL PURPOSES.
Manufactured by:—
THE HORSTMANN GEAR COMPANY, LIMITED,
NEWBRIDGE WORKS—BATH
'Phone:—7241/2. 'Grams:—Horstmann, Bath.

29

PROTECT YOUR SIGHT WITH KANDEM LIGHT
INDUSTRIAL, COMMERCIAL, STREET AND RAILWAY LIGHTING EQUIPMENT of Scientific Design and Superior Quality.
KANDEM ELECTRICAL Ltd.
769 Fulham Rd., London, S.W.6

30

UP-TO-DATE
Street Lighting Equipment
C. H. KEMPTON & Co., Ltd.,
Stangate House, 235, Westminster Bridge Road, London, S.W.1

31

LINOLITE *for Cornice Lighting*
LINOLITE LTD., 96 VICTORIA STREET, S.W.1.

32

MEK-ELEK Engineering Ltd.,
16, Douglas Street, LONDON, S.W.1
Victoria 5707. Cables: Mekelek, London

33

W. PARKINSON & CO
PROMOTERS OF SCIENTIFIC STREET LIGHTING BY GAS
Our Research Lighting Bureau will solve your problems
IRON LANE · STECHFORD · BIRMINGHAM
Tel. No.: Stechford 2256. And at London and Belfast.

34

PEARCE NEON
THE SIGN OF A GOOD SIGN
NEW CROSS 3880-1-2

35

F. H. PRIDE (Herbert C. Pride, M.B.E.)
ILLUMINATING ENGINEER
CINEMA LIGHTING SPECIALIST
Designer and Manufacturer of MODERN Lighting Fitments and Electrical apparatus.
Works and Showrooms: 69/81, High St., Clapham, S.W.4. Telephone:
1, St. Lukes Road, Clapham, S.W.4. Macaulay 2281/2.

36

RADIOVISOR PARENT, LTD.
28, LITTLE RUSSELL STREET, LONDON, W.C.1.
LIGHT ACTUATED APPARATUS
CONTROL OF STREET, FACTORY, AND SIGN LIGHTING.
SMOKE INDICATOR AND RECORDER.

40

PHOTO-ELECTRIC CELLS
Selenium Layer Type (Brit. Pat.) round or Rectangular, for all kinds of light-sensitive apparata.
STAFFORD & LESLIE,
ARMOUR HOUSE, ST. MARTIN'S-LE-GRAND, LONDON, E.C.1.
Tel. National 5025.

41

STRAIGHT-LITE REFLECTORS, LTD.,
73, CANONBURY ROAD, LONDON, N.1.
DESIGNERS AND ACTUAL MANUFACTURERS OF MODERN :: FITTINGS AND ARCHITECTURAL LIGHTING UNITS ::
Telephone: CANonbury 2066 (two lines).

42

STRAND ELECTRIC
AND ENGINEERING Co.LTD.
SPECIALISTS IN COLOUR LIGHTING and STAGE EQUIPMENT
LIGHTING FOR ALL GALA OCCASIONS
THEATRES: EXHIBITIONS
FLOODLIGHTING: CINEMAS
BALLROOMS: PAGEANTS
19-24 FLORAL ST. LONDON, W.C.2

43

For every type of GAS LIGHTING
SUGG WESTMINSTER
When you want the best!
CHAPTER ST. S.W.1

Index to "Where to Buy"

Accessories	38	Industrial Lighting	4, 15, 16, 46
Architectural Lighting	12, 23, 25, 31, 41, 44, 45	Local Lighting	13, 32
Automatic Light Control	22, 28, 36	Neon Signs	34
Books on Illumination and Photometry	7	Photo Electric Cells	36, 40
Cinema Lighting	27, 35, 42	Photometers	2, 17, 47
Concrete Pillars, etc.	8	Reflectors	3, 4, 9, 10, 11, 14, 15, 41, 46
Electrical Contracting	4, 12	Signal Lights	21, 46
Electric Lamps	5, 37, 44	Special Lighting	3, 23, 29, 37, 42, 44
Film Studio Equipment	29	Steel Standards	6
Fittings	1, 3, 4, 9, 10, 16, 19, 23, 24, 25, 26, 27, 29, 30, 31, 32, 35, 37, 41, 45	Street Lighting Units	14, 16, 20, 27, 30, 33, 43, 46
Floodlighting	19, 27, 37, 42, 43	Testing Laboratories	18
Gaslighting	20, 30, 33, 43	Theatre Lighting	42
Glassware	9, 24, 27	Time Switches	22, 28
Guardposts	21, 24	Traffic Signs	23, 24
		Winches and Suspension Gear	39

N.B.—The numbers are those attached to individual entries in the Directory (See pp. 27-30.)

37

SIEMENS
38-39, UPPER THAMES STREET, LONDON, E.C.4
ELECTRIC LAMPS of all types. "SIERAY" ELECTRIC DISCHARGE LAMPS. ELECTRIC LIGHT FITTINGS. FLOODLIGHTING APPARATUS. SHOP-WINDOW LIGHTING EQUIPMENT. STORE LIGHTING. INDUSTRIAL LIGHTING, CINEMA LIGHTING, ELECTRIC SIGNS, ETC.

38

NIPHAN
PLUGS, SOCKETS, TEES, COUPLINGS, TERMINAL SOCKETS AND JOINT BOXES
for every portable and temporary lighting requirement.
SIMMONDS & STOKES, LTD.
VICTORIA HOUSE, SOUTHAMPTON ROW, LONDON, W.C.1
Phones: (Head Office) Holborn 8637; (Works) Putney 1364

39

WASK
PATENT SELF SUSTAINING
WINCHES
FOR ALL PURPOSES
Quick hoisting with little effort
MADE IN TWO SIZES
Walter Slingsby & Co. Ltd., Keighley

44

ARCHITECTURAL ILLUMINATION
"BARLUX" TUBELAMPS
TUBELIGHT SALES LTD · 23 PANTON ST · S.W.1

45

ULTRALUX
LIGHTING FITTINGS
TROUGHTON & YOUNG LTD.
143 KNIGHTSBRIDGE

46

WARDLE ENGINEERING Co., Ltd.
OLD TRAFFORD, MANCHESTER, 16.
STREET LIGHTING EQUIPMENT. FLOODLIGHT PROJECTORS
WORKSLITE REFLECTORS. WARDELYTE GLASSWARE
PRISMALUX DIRECTIONAL UNITS.

47

We invite Enquiries from Readers or Particulars of "Wants" such as might be satisfied by Advertisers in this Directory.

Reduction in Price of Electric Lamps

An important announcement last month by firms associated with the Electric Lamps Manufacturers' Association relates to a further reduction in the price of service gas-filled incandescent lamps.

In the case of 150-watt clear and pearl lamps the price is reduced from 4s. 3d. to 3s. 6d., and in the case of opal bulb lamps from 4s. 10d. to 4s.

In the case of 200-watt lamps the reduction is still more substantial, 1s. being taken off the list-price of all three types (clear, pearl, and opal).

These changes relate both to 100—130-volt and 200—260-volt ranges. Colour-sprayed and "daylight blue" lamps are also affected.

Sight Meter Display in Aldwych

This novel display, recently installed in The B.T.-H. Company's Crown House window, demonstrated in a very effective manner the need for better artificial lighting. The needle of the Foot

Candle Meter, actuated by a solenoid and automatic cutout, swings backward and forward across the scale. When it is pointing towards the zero end of the scale the mask labelled "fatigue" is illuminated; when it swings over to the other end of the scale, the "comfort" mask is lighted.

Catalogues and Advertising Literature

We invite all firms in the Lighting Industry to send us new catalogues as they appear, for reference in these columns.

CLAUDE-GENERAL NEON LIGHTS, LTD.—Leaflet illustrating Cleora Fluorescent Tubes.

FALK STADELMANN & Co., LTD.—Catalogue (No. 727) featuring Efesca Floodlighting Equipment and Coronation Illuminations.

GENERAL ELECTRIC Co., LTD.—Catalogue of G.E.C. Electrical Illuminations for the Coronation Celebrations.

HOLOPHANE, LTD.—Holophane Development Supplement; Electric Light Fittings.

HORSTMAN GEAR COMPANY, LTD.—Reprint of article describing the Newbridge Comet (Electro-Catalytic) Device.

Contracts Closed

THE BRITISH THOMSON-HOUSTON Co., LTD.

County Borough of South Shields—For the supply of Mazda lamps for the twelve months ending December, 1937.

City and County of Newcastle-on-Tyne—For the supply of Mazda lamps for six months commencing January, 1937.

AUTHENTIC INFORMATION

The ELECTRICAL REVIEW

FOUNDED 1872

The authoritative record of technical and business news in the Electrical Industry.

Audited Net Sales

10,936 Copies per week.

EVERY FRIDAY — 6d.

Subscription Rates.	*Postage Free.*
United Kingdom	£1 14s. 8d.
Canada	£1 12s. 6d.
Colonial and Foreign	£2 1s. 6d.

DORSET HOUSE, STAMFORD ST., S.E.1

'Phone: Waterloo 3333

"LUX"

(La Revue de l'Eclairage)

WE have pleasure in announcing to our readers that we have entered into an arrangement to receive subscriptions for the French Journal "Lux" (La Revue de l'Eclairage). The subscription per annum is 30 francs, the approximate equivalent of which in English money is Seven Shillings and Sixpence (7/6).

"Lux" is the only French journal which specialises in all aspects of Lighting; it is the official organ of the Association Française des Ingenieurs de l'Eclairage (equivalent to the Illuminating Engineering Society in France).

It furnishes a complete record of interesting developments in lighting in France and on the Continent. It is fully illustrated and in particular devotes a considerable number of its pages to Decorative Lighting.

By studying these articles and the numerous photographic reproductions of modern lighting installations the reader can readily gain an excellent impression of French methods and practice in matters of Illumination.

Applications for subscriptions will be received by "Light and Lighting," 32, Victoria Street, London, S.W.1.

IMPORTANT NEW GAS LIGHTING CONTRACTS FOR LONDON

Westminster, Holborn, Paddington, Southall-Norwood—and now Chelsea. The list of 15-year contracts embodying gas for street lighting in London boroughs is steadily growing. Chelsea's new agreement affects the lighting of the side streets in the Borough and that on thirteen main traffic routes. By the addition of special reflective devices and the raising of the candle power of existing lamps, the illumination of all side streets will be doubled; while the lighting of the main roads will be brought up to the standard laid down by the interim report of the Ministry of Transport Departmental Committee on Street Lighting.

Another important contract signed this year for gas lighting in London affects about 106 miles of roads in Wandsworth. The agreement is for a period of 5 years and the system employed will be high-pressure gas lighting for main roads and low pressure for the remainder. The new lamps are to be installed at the rate of 270 a week until the remodelling of Wandsworth's lighting is completed. About 5,000 modern gas-lamps will be fixed under the scheme of modernisation.

Among the many 1935 and 1936 contracts which specify the use of gas for public lighting may be mentioned the following:—

15-YEAR CONTRACTS: *Southall-Norwood, Whitstable, Hendon, Dagenham.*

10-YEAR CONTRACTS: *Ruislip-Northwood, Ilfracombe, Cambridge, Blyth, Northampton, Southwark, Penge, Margate.*

7-YEAR CONTRACTS: *Harrow, Wanstead-Woodford, Farnhill, Brightlingsea, Selkirk, Hatfield.*

5-YEAR CONTRACTS: *Welshpool, Budleigh Salterton, Deal, Wembley, Brentwood, Falmouth, Walton-on-Thames, Diss, Egham, Kidwelly.*

ISSUED BY THE BRITISH COMMERCIAL GAS ASSOCIATION, 1, GROSVENOR PLACE, LONDON, S.W.1.

HOLOPHANE *SCIENTIFIC* ILLUMINATION

AT THE NEW TIR JOHN POWER STATION SWANSEA

Turbine House lighted by Overhead Units and special Wall Lanterns incorporating Lens Plates.

Side. Photo of Control Room Laylighting by Prismatic Reflectors.

UNTOUCHED NIGHT PHOTOS.

PREECE, CARDEW & RIDER, Consulting Engineers.

COLSTON ELEC. CO., LTD., BRISTOL, Elec. Contractors.

Boiler Room lighted by Holophane Heavy Duty Reflectors and special Trough Units.

Holophane SCIENTIFIC ILLUMINATION THE HALLMARK OF GOOD LIGHTING.

Power Station Lighting calls for the highest degree of efficiency and skilful planning to satisfy the critical authorities who are the leading experts for the various departments of Electricity Supply.

The modern super power station must be a model of electrical efficiency and design. With such a high degree of efficiency required, it was decided to instal HOLOPHANE AT THE NEW TIR JOHN POWER STATION. HOLOPHANE experts in conjunction with the consulting engineers prepared a lighting scheme which incorporated many novel features. The completed installation has been highly praised as an excellent example of modern lighting practice.

FOR BETTER INDUSTRIAL LIGHTING
SPECIFY HOLOPHANE — THE CHOICE OF EXPERTS

WRITE FOR COPY OF "*SCIENTIFIC INDUSTRIAL LIGHTING.*"

HOLOPHANE LTD., 1, ELVERTON ST., VINCENT SQUARE, LONDON, S.W.I

'GRAMS: HOLOPHANE, SOWEST, LONDON 'PHONE: VICTORIA 8062 (3 Lines)

Printed by the ARGUS PRESS, LTD., Temple-avenue and Tudor-street, London, E.C.4, England.